BAIKAL INTERNATIONAL CONFERENCE

"GEOLOGY OF MINERAL DEPOSITS"

ULAN-UDE, ENKHALUK ON THE BAIKAL

MARCH 20-24, 2012

Geological Institute, Siberian Branch, Russian Academy of Science
Buryat State University
EPS Global Medical Development Inc.

BAIKAL INTERNATIONAL CONFERENCE "GEOLOGY OF MINERAL DEPOSITS"

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CO-CHAIRMANS:
DOBRETSOV N.L. – Chairman of United Scientific Council of SB RAS on the Earth Science, academician
KALMYKOV S.V. – Rector of Buryat State University, corresponding member of Russian Education Academy
KISLOV E.V. – Acting chief of laboratory of Geological Institute, Dr. (Program and Abstracts Editor)
TAT'KOV G.I. – Director of Geological Institute, Prof.
YAO LU - President of EPS Global Medical Development Inc., Dr.

ULAN-UDE

2012

PROGRAMM

19 of March:

fly from the Moscow by air company S7.

20 of March:

9:00 - transfer from Ulan-Ude airport to the Enhkaluk on Baikal lake bank.

12:00 - rest, registration, lunch, walking.

17:00 – Opening ceremony.

Dobretsov N.L., Koulakov I.Yu. (Novosibirsk, Russia) THE WAYS OF MAGMA-FLUID TRANSPORT UNDER ISLAND ARCS AND THE COMPOSITION OF THE KAMCHATKA VOLCANIC ROCKS.

19:00 – dinner.

21 of March:

9:00-9:20:

Gorkovets V.Ya, Rayevskaya M.B., Dudarev A.M., Popov M.G., Maksimovich L.A., Rudashevsky N.S., Rudashevsky V.N. (Petrozavodsk, Kostomuksha, St.Petersburg, Russia) KOSTOMUKSHA IRON ORE PROVINCE, REPUBLIC OF KARELIA: THE BIGGEST COMPLEX ORE DEPOSIT IN NORTHWEST RUSSIA

9:20-9:40:

Tselyuk I.N., Tselyuk D.I. (Krasnoyarsk, Russia) RESOURCE POTENCIAL OF THE STALE TAILS IRON ORE DEPOSITS AT EASTERN SIBERIA

9:40-10:00:

Ramdohr R.P., Evstigneeva T.L. (Ouagadougou, Burkina Faso; Moscow, Russia) GOLD MINERALIZATION OF NEW ORE OCCURRENCE AT NOUNGOU, BURKINA FASO

10:00-10:20:

Kostin A.V. (Yakutsk, Russia) UNDISCOVERED MINERAL RESOURCES AND GIS: A NEW IRON OXIDE COPER GOLD (IOCG) DEPOSIT TYPE IN EASTERN YAKUTIA WITH COMPLEX AU-U AND PT-CU-HG GEOCHEMICAL ANOMALY (TARYNSKIY ORE NODE)

10:20-10:40:

Tauson V.L., Smagunov N.V. (Irkutsk, Russia) DUAL DISTRIBUTION COEFFICIENTS OF TRACE ELEMENTS AND ESTIMATION OF GOLD CONTENTS IN HYDROTHERMAL FLUIDS

10:40-11:00:

COFEE BREAK

11:00-11:20:

Anikina E., Klubnikin G. (Moscow, Russia) GEOCHEMICAL FEATURES OF MANGAZEYSKOE DEPOSIT (SAKHA-YAKUTIA): FLUID INCLUSIONS AND STABLE ISOTOPES

11:20-11:40:

Pystin A.M., Potapov I.L., Pystina Yu.I. (Syktyvkar, Russia) THE OZERNOE GOLD-PLATINUM MANIFESTATION (THE POLAR URALS): GEOLOGICAL STRUCTURE, ORE MINERALIZATION, GENESIS

11:40-12:00:

Nikolaev Yu.N., Baksheev I.A., Chitalin A.F., Kal'ko I.A. (Moscow, Russia) THE NEW DATA OF GEOLOGY, MINERALOGY, AND GEOCHEMISTRY OF THE BAIMKA CU-AU TREND, CHUKCHI PENINSULA, RUSSIA

12:00-12:20:

Sotskaya O.T., Goryachev N.A. (Magadan, Russia) ABOUT MICROMINERALOGY OF "BLACK SHALE" DISSEMINATED-SULPHIDE ORES OF THE NORTH-EAST OF RUSSIA

12:20-13:00:

DISCUSSION

13:00-14:00:

LUNCH

14:00-14:20:

Tatkov I.G., Tatkov G.I. (Ulan-Ude, Russia) THE COMPLEX GEOPHYSICAL INVESTIGATIONS TO SEARCH FOR GOLD DEPOSITS IN THE BURYAT REPUBLIC

14:20-14:40:

Konnikov E.G., Danyushevsky L.V., Ariskin A.A., Nikolaev G.S., Kislov E.V. (Chernogolovka, Russia; Hobart, Australia; Moscow, Ulan-Ude, Russia) SYNNYR RANGE NEOPROTEROZOIC MAGMATISM AND PGE-NI-CU-BEARING IOKO-DOVYREN LAYERED MASSIF

14:40-15:00:

Khomich V.G., Boriskina N.G., Shevyrev S.L. (Vladivostok, Russia) PLACER PLATINUM CONTENT OF SOUTH-EAST RUSSIA

15:00-15:20:

Rogulina L.I. (Blagoveshchensk, Russia) MINERAL PARAGENESIS AND LOCALIZATION CONDITIONS OF ORES OF SILVER DEPOSIT TAEZHNOE

15:20-15:40:

Trunilina V.A., Roev S.P. (Yakutsk, Russia) RELATION BETWEEN BASIC AND ACID MAGMATISM IN TIN-BEARING AREAS OF EASTERN YAKUTIA

15:40-16:00:

COFEE BREAK

16:00-16:20:

Marushchenko L.I., Baksheev I.A. (Moscow, Russia) MINERALOGY OF PROPILYTE OF THE PESCHANKA PORPHYRY-COPPER DEPOSIT, CHUKCHI PENINSULA, RUSSIA

16:20-16:40:

Antipin V.S. (Irkutsk, Russia) RARE METAL GRANITOIDS OF BAIKAL AREA AND MONGOLIA: GEOCHEMICAL AND GEODYNAMIC FEATURES, RELATED MINERALIZATION

16:40-17:00:

Kostrovitsky S.I. (Irkutsk, Russia) THE ORIGIN OF KIMBERLITES (FROM CHEMICAL AND ISOTOPE-GEOCHEMICAL DATA)

17:00-17:20:

Belyaev E.V. (Kazan, Russia) THE PERSPEKTIVE CONTAINING OF APATITES IN THE GREENSTONE BELTS OF THE WORLD

17:20-18:00:

DISCUSSION

22 of March:

9:00-9:20:

Adabi M.H., Salehi M.A. (Tehran, Iran) DEPOSITINAL ENVIRONMENT, SEQUENCE STRATIGRAPHY AND GEOCHEMISTRY OF LOWER CRETACEOUS CARBONATES (FAHLIYAN FORMATION), S.W. IRAN

9:20-9:40:

Ustinov S.A., Petrov V.A. (Moscow, Russia) RECONSTRUCTION OF FLUID MIGRATION EVENTS AT THE ANTEI URANIUM DEPOSIT: GEOSTRUCTURAL EVALUATIVE APPROACH

9:40-10:00:

Shevyrev S.L. (Vladivostok, Russia) ANALYSIS OF STRUCTURAL FRACTURING PATTERNS FOR AIMS OF FORECAST METALLOGENY (DALNEGORSK ORE DISTRICT, PRIMORSKY KRAY)

10:00-10:20:

Shinohara K. (Kanagawa, Japan) A FATIGUE-LIFE EVALUATION TECHNIQUE FOR POWER SEMICONDUCTOR DEVICES

10:20-10:40:

Khandelwal M., Singh T.N. (Udaipur, Mumbai, India) APPLICATIONS OF ARTIFICIAL NEURAL NETWORK FOR THE ASSESSMENT OF BLAST-INDUCED GROUND VIBRATION

10:40-11:00:

COFEE BREAK

11:00-11:20:

Obzhirov A. (Vladivostok. Russia) REGULARITY TO FORM GAS HYDRATE AND OIL-GAS DEPOSIT AND GAS GEOCHEMICAL METHOD TO SEARCH IT

11:20-11:40:

Jayaperumal D. (Karaikudi, India) MITIGATING THE DETERIORATION OF STEEL TUBE IN HYDROCHLORIC ACID SOLUTION USING SOME ALDEHYDE COMPOUNDS DURING ACIDIZATION PROCESS

11:40-12:00:

Medvedeva I.V., Zhakov S., Uimin M., Byzov I., Mysik A., Yermakov A., Tsurin V., Shchegoleva N., Hankova A. (Ekaterinburg, Russia) APPLICATION OF MAGNETITE NANOPARTICLES FOR METALLIC CATIONS REMOVAL FROM WATER

12:00-12:20:

Ahmad I. (Lucknow, India) MONITORING AND IDENTIFICATION OF AIRBORNE ASBESTOS IN UNORGANIZED SECTORS IN INDIA

12:20-13:00:

DISCUSSION

13:00-14:00:

LUNCH

14:00-14:20:

R.S. Singh, N. Tripathi, S.K. Chaulya (Dhanbad, India) REVEGETATION IMPROVES SOIL FERTILITY AND DUMP STABILITY OF COAL MINE SPOIL IN INDIAN DRY TROPICAL ENVIRONMENT

14:20-14:40:

Semenova I.V., Petrov V.A. (Moscow, Russia) CHEMICAL COMPOSITION FEATURES OF SOILS AROUND TAILING POND OF MIZURSKY PROCESSING PLANT (NORTH CAUCASUS, RUSSIA)

14:40-15:00:

Sabol J. (Prague, Czech Rep.) ASSESSMENT OF THE TOTAL EFFECTIVE DOSE OF MINERS IN THE UNDERGROUND ROŽNÁ URANIUM MINE DURING THE PERIOD OF 2004-2011 AND THE OVERVIEW OF URANIUM DEPISITS IN THE CZECH REPUBLIC

15:00-15:20:

Zied D.C. (Botucatu, Brazil) EFFECTS OF NON-AXENIC CASING SOIL ON MEDICINAL MUSHROOM GROWTH

15:20-15:40:

COFEE BREAK

15:40-16:00:

Barut I.F. (Istanbul, Turkey) THE RESPONSE OF BENTHIC FORAMINIFERA AND OSTRACODA TO HEAVY METAL POLLUTION IN GULF OF IZMIR (EASTERN AEGEAN SEA)

16:00-16:20:

Jasem Al-Awadhi (Safat, Kuwait) MODELING THE AEOLIAN SAND TRANSPORT FOR THE DESERT OF KUWAIT: CONSTRAINTS BY FIELD OBSERVATIONS

16:20-18:00:

DISCUSSION

23 of March:

9:00 – transfer to Ulan-Ude.

12:00 - accommodation, lunch, excursions to Ethnographical museum with mini zoo on the open air, Buddhist temple, Historical museum (Buddhist art collection).

24 of March:

9:40 - fly to the Moscow.

Nikolay Dobretsov, academician of the Russian Academy of Sciences (born 15.01.1936 in Leningrad)

Nikolay Dobretsov was elected a member of the Academy of Sciences of the USSR in 1987 (a corresponding member from 1984). He became a vice-president of the Russian Academy of Sciences and the chairman of the Siberian Branch. Nikolay Dobretsov was a director general of Trofimuk United Institute of Geology, Geophysics and Mineralogy (UIGGM), a director of the Geological Institute of UIGGM.

The primary focus of his research is in the fields of mineralogy, geology, petrology and tectonics. Nikolay Dobretsov has authored and co-authored over 500 scientific papers including 22 books.

In 1976 Nikolay Dobretsov received the Lenin prize, in 1997 he was awarded the state prize of the Russian Federation and in 1999 he received the Demidov prize.

After the graduation from the Plekhanov Mining Institute in Leningrad in 1957 Nikolay Dobretsov worked as a geologist, a head of a group in geological survey expedition in Altai (1957-1960). In the Institute of Geology and Geophysics of the Siberian Branch he was a research fellow (1960-1071), then a head of a laboratory (1972-1980). In the Institute of Tectonics and Geophysics of the Far Eastern Scientific Centre of the Siberian Branch he was a head of laboratory (1971-1972). He was a director of the Geological Institute of the Buryat Scientific Centre of the Siberian Branch (1980-1988), and the chairman of the Buryat Scientific Centre from 1987. In 1988 he became the director of the Institute of Geology and Geophysics and the director general of Trofimuk United Institute of Geology, Geophysics and Mineralogy and the director of the Geological Institute of UIGGM (since 1990). At 1997-2008 Nikolay Dobretsov was the chairman of the Siberian Branch and a vice-president of the Russian Academy of Sciences.

Nikolay Dobretsov is a member of the Petrografic and Tectonic Committees of the Russian Academy of Sciences, a member of the National Committee on the International Geosphere-Biosphere Programme (IGBP), and other scientific committees. He is a member of the editorial boards of several scientific journals. Nikolay Dobretsov is a vice-president of the Association of Academies of Sciences in Asia (AASA), a foreign member of several academies, a honorary doctor of a number of universities in Russia and abroad.

In recognition of his accomplishments in civil service, Nikolay Dobretsov became a Cavalier of the Order of the Red Banner of Labour in 1986.

THE WAYS OF MAGMA-FLUID TRANSPORT UNDER ISLAND ARCS AND THE COMPOSITION OF THE KAMCHATKA VOLCANIC ROCKS

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Mineral deposits in folded belts are usually directly connected with magmatism in areas of island arcs and mantle plumes. In the paper we present new finding on arc magmatism based on results of seismic tomography, experimental data and revisiting published analyses of the Kamchatka volcanic rocks and minerals (Ivanov, 2008).

The regional tomographic models of the upper mantle beneath the Kurile-Kamchatka and Aleutian arcs (Koulakov et al., 2011a) show that the structure of the subduction zone is more complicated than an over-simplified 2D picture of a conveyer-type oceanic platesinking. The plate configuration with variable thickness is typical for the upper part of the subduction down to 200-300 km depth. At greater depths, seismic tomography results reveal considerable variations in slab behavior. In some segments of the subduction zone (such as in the area of S. Kuriles and Hokkaido), the slab flattens in the transition zone (between 410 and 670 km depth) and follows horizontally away from the subduction to distances of 1500 km, at least. In other places (such as N. Kuriles), the slab behaves as a large drop which is accumulated in the transition zone, and when reaching a critical mass it penetrates to the lower mantle. It was additionally suggested the possibility of solid material transfer at the vicinity of the subducting plate including brittle and viscous imbrication of oceanic sediments and altered basalt layer. “Subduction erosion” and “delamination” lead to additional subduction metasediments of eclogitic facies.

The detailed tomographic model beneath the Kluchevskoy group of volcanoes (Koulakov et al., 2011b) reveals a clear image of the mantle diapir at a basement of the crust. Extremely high Vp/Vs ratio reaching 2.2 in this feature indicates to high content of fluids and melts which are probably brought from the subducting plate. In the crust, two levels of intermediate chambers at 12-15 km and 0-3 km are observed beneath the Kluchevskoy volcano. It was found that they seem to disappear after large eruption of the Kluchevskoy volcano and reappear again after several years. This shows that the Kluchevskoy volcano is fed through a complex system of intermediate chambers which explains strong variability of magma compositions and eruption regimes. On the other hand, beneath Bezymyanny, we observe a direct channel between the mantle source and the volcano which appeared during the activation period in 2005. This indicates to the direct feeding of the Bezymyanny volcano with H2O rich andesitic magmas from the mantle sources below 30 km depth.

In general, we can distinguish five levels of magma origin and modifications: (1) 100-120 km depth level of the water-rich andesitic magma in eclogite facies. (2) 50-70 km level of fluid-fluxed or melt-fluxed reactions of upwelling fluids or melts from the 1st level with overlying hot mantle pridotite producing a hybrid “primary melt” in which most major components (MgO, FeO, NiOetc) are derived or controlled by the mantle, while most of alkalis and incompatibletrace elements come from the initial melt of subducted material. (3) Transitional magma chamber at 30 km depth in which main processes of crystal fractionation can occur. (4) Varied intermediate chamber at 15 km depth with possible assimilation of the crustal material. (5) 0-5 km depth local chambers under volcanoes are ephemeral and originated just before eruption. The role and the contributions of levels 1, 2 and 3 are different during the volcanism activation and relaxation periods between them.

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Background: 1960 – graduated from Petrozavodsk State University

1960-2012 – Senior Laboratory Assistant-Researcher; Senior Scientist; Deputy Director for Science, Institute of Geology; Head of the Laboratory of Iron Ore Geology, Leading Scientist.

Academic degrees:

1969 – Candidate of Science (Geology-Mineralogy)

1992 – Doctor of Science (Geology-Mineralogy)

Basic fields of research: geology, metallogeny and facies analysis of Early Precambrian iron ore and diamondiferous kimberlite complexes, ore formation and geoecology.

Professor. Teach lithology and prospecting and exploration of mineral deposits at the Geology and Mining Department, Geology and Geophysics Section, Petrozavodsk State University.

KOSTOMUKSHA IRON ORE PROVINCE, REPUBLIC OF KARELIA: THE BIGGEST COMPLEX ORE DEPOSIT IN NORTHWEST RUSSIA

Gorkovets V.Ya.[1], Rayevskaya M.B.[1], Dudarev A.M.[2], Popov M.G.[1], Maksimovich L.A.[2], Rudashevsky N.S.[3], Rudashevsky V.N.[3]

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[2]*Karelsky Okatysh (Severstal) OJSC, Kostomuksha, Russia, post@kostomuksha.ru*

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In Early Precambrian time endogenous activity and the pattern of ore-forming processes in the Fennoscandian Shield were dependent on a geodynamic regime responsible for the evolution of magmatism, metamorphism and sediment formation. These processes produced ore-bearing structures with complex mineralogenic specialization.

Geologically, the Kostomuksha Ore Province in Karelia is the most significant, best studied and promising province of Northwest Russia.

The background of the geological study of the Kostomuksha Ore Province, which comprises various genetic types of polychromous ore formation, is discussed. Distinctive iron-cherty, gold and diamondiferous ore formations were generated in common geodynamic settings that succeeded each other in this territory from Neoarchaean to Neoproterozoic time (from 2.9 to 1.23 inclusive), and were associated with the uplift of the Voknavolok block above a mantle diapir [1].

Kontokki tholeiitic basalt, komatiites and felsic volcanics of rhyodacite composition intruded along the deep fault zones that rimmed the Voknavolok block in the Neoarchaean (2.9-2.8 Ga). Two iron formations: a rhyodacitic iron-cherty formation and the most productive terrigenous (flysch) iron-cherty formation (Gimoly series) developed during the Neoarchaean. The rocks and ores which constitute this formation were produced under areal chemical weathering crust conditions on a Palaeoarchaean granulitic basement and underlying Lopian Kontokki volcano-sedimentary units, and are represented by the Kostomuksha iron deposit, which has the biggest iron reserves (over 10 billion t) in the Fennoscandian Shield. As the iron ore reserves of the deposit make up 1.94% of the proven iron ore reserves of the world deposits, it is recognized as a superlarge deposit [2].

Polychronous stages in tectonomagmatic activation (1.23 Ga) on the Karelian Craton were responsible for the metallogeny of this territory. In the Kostomuksha Ore Province the gold occurrences are associated with three stages of tectonomagmatic activation, the most productive of which is a Palaeoproterozoic stage associated with Seletsk and rapakivi-like granite occurrences (2.45 Ga). The predicted Au resources of the Luupeansuo ore occurrence are estimated at 125 t.

A Riphean stage in tectonomagmatic activation (1.23Ga) in the Kostomuksha Ore Province was remarkable for the development of diamondiferous kimberlites and lamproites and was controlled by mantle deep-focus long-lived tectonic zones.

The Kostomuksha Ore Province is considered the largest complex ore province of the Republic of Karelia, based on the presence of the Fennoscandian Shield's largest Kostomuksha iron deposit, the large Luupeansuo gold occurrence and diamondiferous kimberlite and lamproite diatremes.

1. Deep structure and evolution of the Earth's crust in the eastern Fennoscandian Shield: Kem-Kalevala profile. Petrozavodsk: KarRC, RAS, 2001. 194 p.

2. Gorkovets V.Ya., Rayevskaya M.B. Geology and ore potential of geological formations in the Kostomuksha Ore Province // Large and superlarge deposits, distribution pattern and conditions of formation. ESU, RAS, Moscow, 2004. P. 95-109.

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Birth data: 1957/09/29
Address: Russia, 660049, 62, Karl Marx Str., Krasnoyark.
e-mail: intseluk@mail.ru

Recent status: General Director of Gravimetry Expedition # 3 Join Stock C^{o}

Resume:

- 1979: graduated from Krasnoyarsk M. I. Kalynin Institute for non-ferrous metals; qualified as engineer-geologist
- 1979-2000: Krasnoyrsk Geology Administration, Complex Geological Expedition - geologist, senior geologist, leading geologist, team of the group
- 2000-2003: Federal State Enterprise "Center for nature environment", Director
- 2003-2005: Krasnoyarsk Administration of Federal Service for environment supervision, chief of department
- 2005-2011: Krasnoyarsk scientific investigate institute for geology and raw minerals, Director
- 2011-r.t.: Gravimetry Expedition # 3 Join Stock C^{o} , General Director

Academy Qualification:

- 1990: PhD for Geology

- 2003: counsellor of Russian Federation of 2nd class
- 2011: excellent of geological prospecting

Area of scientific investigation:

- elaboration for base of complex nature use
- scientific substantiation for base, elaboration and realization of Federal and Regional geological study programs
- Regional geological, geophysical, geochemistry and prognostic metallogenetics investigations
-

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Recent status: director for industry technogenesis laboratory

Resume:

- 2004: graduated from Krasnoyarsk State Technical Institute
- 2004-2007: post-graduate at Polytechnical Institute of Siberian Federal University
- 2007-r.t.: Krasnoyarsk scientific investigate institute for geology and raw minerals, leading engineer, director for laboratory

Academy Qualification:

- 2009: PhD for Geology

Area of scientific investigation:

- Scientific Investigate works for conversion of tecnogenical mineral resources on Eastern Siberia
- Study of ecological and geo-ecological problems related to natural and tecnogenical use minerals and their reproduction
- Organization and leading of geo-ecological monitoring for natural and technogenical objects on Eastern Siberia

RESOURCE POTENCIAL OF THE STALE TAILS IRON ORE DEPOSITS AT EASTERN SIBERIA

I.N. Tselyuk, D.I. Tselyuk
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At the Krasnoyarsk Territory, the Irbinsky and Krasnokamensky mine administrations carry out the iron deposits. At the dry tails stock at Irbinsky administration within 5554.6 thous. m^3 are accumulated. At Krasnokamensky administration the Krasnokamensk iron deposits group (Margot, Single, and Rudny Cascade ones) are developing. Since 1969 at the Grabovsky stream valley, more than 15 mln. m^3 tails deposits are accumulated. To study the tails peculiarities, the drilling within 30 meters was carried out at Krasnokamensky administration. At Irbinsky administration, the tails stack was mined with pits within south wall of the technological massif.

Tails of dry separation at Irbinsky administration contain 25.6% of silica and 11.3% of iron. Concentration of other elements is less than 5%. The host rocks contain to 67%, including to 17% of quartz, epidote, plagioclase, and carbonates, and to 16% of ore minerals. The ore minerals are: magnetite (3%), pyrolusite (3%), hematite (to 4%), sulfides (to 2%), psilomelane, limonite, yarosite (4%).

At Krasnokamensky mine group the section of alluvial tails consists of two horizons. The upper one, of thickness within 6 m, contains to 17% of total iron. Upon chemical composition the horizon refers to silica - high iron type. The mineral composition contains of quartz (45%), hematite and magnetite (15%), albite (15%), the last minerals are of 25%. Upon mineral composition the ore masse belongs to hematiite - magnetite type. The lower horizon, within interval from 6.0 to 30.0 m, contains an average iron masse of 29%. The chemical composition refers to hyper-iron type. The mineral composition concludes 40% of quartz and 20% of goethite, hematite, and magnetite. A peculiarity of the horizon is an amorphous phase of fine dispersed iron and aluminum hydroxide. The tails belong to hematite - magnetite - goethite type.

The resource of man-made deposits at Irbinsky administration is of 9.802.235 tons of iron, with its total content within 13%. The resource of Krasnokamensky administration stale tails upper horizon, at the beach zone, is estimated at 3.762 mln tons, with total iron content within 17%. The sub-surface resources of the tails is of 12.696.750 tons, with total iron content within 29%.

The methods of enrichment are recommended as gravitation and magnetic. The Irbinsky and Krasnokamensky mines are limiting with exhausted of iron reserves. That is among priority task the study of tails for increase of raw materials. During exploration it's necessary take in attention substantial heterogeneous technological massifs and its selection for extraction of raw minerals and their individual optimal technological solutions.

Dr. Reinhard Paul Ramdohr February 2012

After matriculation in **1957** I worked one year as trainee in German mines. In **1963** I obtained the **mining engineering degree** at the Clausthal School of Mines.

This was followed by two and a half years with **Freudenberg Group** in Germany**,** building water treatment plants, before joining **Sentinel Mining Company** in West Australia, searching for iron ore.

1968 Ph.D. in Geology at Heidelberg University in Germany.

The following years I spent as base metal exploration geologist on various projects in South Australia before joining **Aquitaine Australia Minerals** as Project geologist in NT and WA. This work involved all levels of exploration for base metals, gold and uranium. I was instrumental in the discovery of the Sorby Hills lead deposit.

Exploration in Germany and Kanada, USA and Sambia for **Preussag AG from 1976 to 1978.**

From **1978** to **1990** I worked again with the **Freudenberg Group** for investment planning and control. During this period I was involved in industrial projects in Brazil, exploration projects in Senegal and Guinea.

Since **1991** I am working as an independent consultant on various projects, e.g. from **1995** to **1998** for the **German GTZ** to promote small scale gold mining projects in Ghana. Later on RE targets in Ethiopia, fluorite in Mongolia etc. From **2001 to 2010** I spent much time in Madagascar, including four years searching for Uranium for Pan African Mining Corp.

Since 2010 I am Director for High River Gold Exploration in Burkina Faso. Our exploration target is primarily gold, also base metals.

Nationality: German

T.L. Evstigneeva

Tatiana L. Evstigneeva was born in Moscow (1945). She was graduated from Moscow State University in 1967, and in the same year has been employed at Institute of Geology of Ore Deposits, Petrography, Mineralogy and Geochemistry of Russian Academy of Sciences (IGEM RAN) in Moscow, where she works to date. Currently she is a leader resercher of Laboratory of Mineralogy. She received her Ph.D in 1981. Much of her research has focussed on ore mineralogy, crystallochemistry and phase relationships. Particular attention is paid to the problems of Platinum-Group Minerals – composition, crystal structure determination, isomorphism, associations, conditions of formation in a wide temperature range from the melt and hydrothermal solutions. Co-author of 24 new minerals approved by the International CNMMN IMA. Author of 3 books and of more than 150 publications.

GOLD MINERALIZATION OF NEW ORE OCCURRENCE AT NOUNGOU, BURKINA FASO

Reinhard P. Ramdohr[1], Tatiana L. Evstigneeva[2]
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[2]*IGEM RAS, Moscow, Russia*

Noungou is located ~ 50 km NE of Ouagadougou, Burkina Faso. Many outcrops of quartz are found along an overall NE trending greenstone belt. (Where the quartz contains some gold, small scale miners have made diggings, which serve as good guide for prospecting). This belt is distorted in the region between Ouagadougou and Kaya. This distortion could be caused by the lithosphere thickening (small continent?). The deformation could have been instrumental for the occurrence of several zones with gold- copper mineralization.

The formation of intercontinental shallow marine sedimentation of tuffs, graphitic shales and arenaceous layers was often interrupted by acidic and basic volcanism in Lower Proterozoic age (Birrimian), approx. 2180 Ma. Magmatic activity, mainly grano-diorites and some felsic formation at margins of the intercontinental basin, generated a lot of fumarole activity, which gave rise to various stratiform sulphide mineralization. The fumaroles yielded base metals, particularly Cu, and traces of Au.

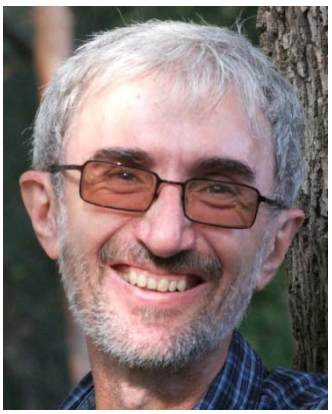
Between 2120 and 2100 Ma the mineralized rocks experienced three phases of deformation, which led to the formation of isoclinal structures. The subsequent shearing and foliation contributed to the formation of quartz veins with sulphides.

The deformation corresponded to the amphibolite grade metamorphism. During this process the sulphides and SiO_2 were mobilized from deposits and then re-deposited again in faults and shear zones, which are mainly subvertical and parallel with the schistosity. Generally quartz veins contain pyrite and phyrotite, some arsenopyrite with traces of gold. When sulphides are located near surface and are weathered, free gold remains and often is concentrated in cementation zones, the small-scale miners exploit the gossan and below to a depth of up to 50m (~ water level) for the gold.

However, it is obvious that original mineralization at Noungou was of the volcanic massive sulphide type (VMS) with pyrite, pyrrhotite, magnetite, chalcopyrite and other Cu – minerals. Gold content is approx. 1 ppm. The subsequent metamorphism and folding mobilized the original mineralization and deposited the sulphides (and oxides) in faults along a corridor of shearing, combined with stockwork and cross cutting veins.

The massives sulphides are presented by pyrite, minor arsenopyrite, chalcopyrite, phyrrotite. Magnetite rich layers also are observed. The preserved original VMS layering is frequently silicified.

The investigation of ore structural peculiarities, of ore mineral composition and their associations, the mineral distribution along the borehole was carried out on samples from several boreholes. Results obtained are used for comparison with published data on characteristics of ore mineral from some types of VMS deposits. Some single data led to the conclusion about native gold and the “invisible” gold in arsenopyrite, but the question of the form of gold occurrence is not yet fully understood. Scanning with electron microscopy, SEM and with energy dispersive analysis, EDA, are in progress.



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Arc GIS and databases projects development for Gold and Silver prospecting.
Precious Metal deposits mineralogy and geology.
Greenfield precious metal projects.

UNDISCOVERED MINERAL RESOURCES AND GIS: A NEW IRON OXIDE COPER GOLD (IOCG) DEPOSIT TYPE IN EASTERN YAKUTIA WITH COMPLEX AU-U AND PT-CU-HG GEOCHEMICAL ANOMALY (TARYNSKIY ORE NODE)

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The prediction and prospecting of new precious metals deposit types is the basic problem of ore deposits geology. Iron oxide copper-gold ore deposits are attractive targets for mineral exploration in the World, but are still unknown in Eastern Yakutia.

The GIS using for predicting of undiscovered precious metals mineral resources [1] showed good results in Rep-Yuruinskiy ore district (Tarynskiy ore node). Some new ore potential areas were deciphered with new ArgGIS service – ArcGisOnline – i-cubed 15m eSAT images. Localized field of reddish-brown collored rocks (63.574957°N 143.275846°E) appeared to be breccias with iron-oxide cement.

The Rep-Yuruinskiy sub-type of IOCG consists granodiorite-associated, breccia-hosted deposit where arsenopyrite ore is associated with iron oxide alteration of breccias (fig. 1a, b). The breccias are commonly heterolithic and composed of sub-angular to more rarely rounded lithic and oxide clasts or fine-grained massive material. The breccias areal limit is about 5.16 km^2, density varies from 2.41 to 3.23 (average = 2.76 t/m^3). The ore resource potential could be about 712 Mt for 50 m thickness.

fig. 1a. Arsenopyrite-cement breccia.

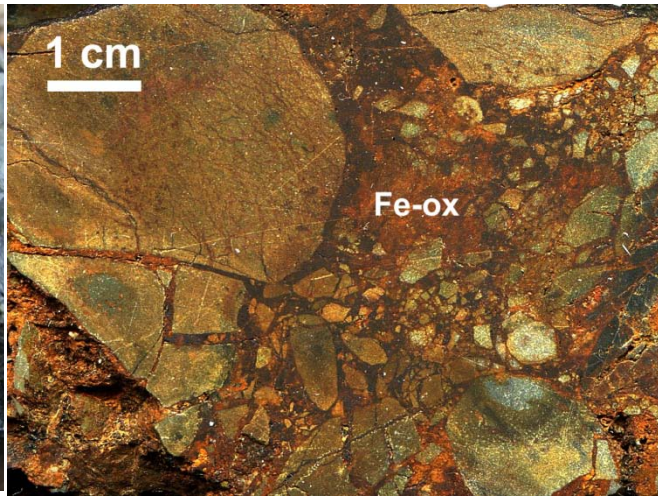

fig.1b. IOCG breccia.

IOCG deposits are good target for different geochemical surveys. Rep-Yuruinskiy nature anomaly was sampled with five lithogeochemical profiles and grab samples, which were tested with Niton XL3t handheld x-ray fluorescence (XRF) analyzer. As a result is was found out a complex iron oxide-Au-U-Pt-Cu(±Hg±Co±Ni±Mo±W±Mn) specialization , that was formed close to the surface of Rep-Yuruinskiy pluton. Average (%): Fe – 8,03; Mn – 6,07; Co – 2,34; Ni – 0,29; U – 0,013; Th – 0,053; Mo – 0,009; Cu – 0,17; Hg – 0,21; As – 0,32; Pb – 0,06; Zn – 0,15; Sn – 0,032; W – 0,24; Au – 0,0214; Pt – 0,38; Ag – no significant.

1. Kostin A.V. GIS as a tool for predicting of undiscovered mineral resources of silver // Geology, tectonics and metallogeny of North-Asian craton. All-Russian scientific conference. Abstracts Volume. – Yakutsk: IPK NEFU, 2011 – T.II. P. 84 – 87.

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DUAL DISTRIBUTION COEFFICIENTS OF TRACE ELEMENTS AND ESTIMATION OF GOLD CONTENTS IN HYDROTHERMAL FLUIDS

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Developing the ideas of Leonid Chernyshev [1], we call attention to the minerals of variable composition as the indicators of minor element behavior in the coexisting fluid (solution) phases. Trace elements (TE) are thought to be the convenient entities for many reasons. From the thermodynamic standpoint, TE represent infinitely diluted solutions both in the mineral matrixes and fluid phases, so they can behave as ideal or at least regular mixtures. Moreover, the structurally bound TE admixtures usually form undersaturated solid solutions in mineral matrixes, and therefore, they are much less sensitive to the post-crystallization events comparing to major components. Nevertheless, we meet difficulties when use TE in practice and the most serious one is the dualistic behavior of distribution coefficient [2, 3]. In the case of gold, a most powerful factor is the accumulation of the metal by surface nanometric phases. Such phases actually represent the altered surface layers of mineral crystals. They are ~300-500 nm thick and differ from the crystal volume in chemical composition, stoichiometry and structure. Thermodynamically, such phase may be considered as a nonautonomous phase (NAP) because it cannot exist as an individual phase of the same composition and structure. A remarkable feature of NAP is their ability to concentrate TE incompatible with the bulk structure of matrix crystal. The experimental study of minor elements distribution in the system Pyrite-Pyrrhotite-Magnetite-Hydrothermal solution-Au, Cd, Mn shows that surface nano-phases are responsible for accumulation of incompatible elements and dualism of distribution coefficient *D*. The original complex of methods was applied to discriminate between modes of TE occurrences [2-4]. This allowed to determine the true *D* values that pertain to the structural component of an admixture D^{str} and bulk coefficient D^{bulk} that is dualistic because contains the contribution from D^{NAP} which have rather high values ($\sim n \times 10^3 D^{str}$). As a result, D_{Au}^{bulk} in pyrite and magnetite are approximately one order of magnitude higher if compared to D_{Au}^{str}. The structurally bound gold contents in pyrites are determined with SSADM technique (statistical sampling of analytical data for monocrystals) using the extrapolation of Au concentration to zero specific surface area of an average crystal. Thus, estimates of gold concentrations in hydrothermal fluids, at least relative, can be acquired. The data obtained are important for reliable estimation of productivity of ore-bearing solutions and the scale of gold mineralization. Many examples for gold and Au-Ag deposits are presented.

We are indebted to the Russian Foundation for Basic Research for supporting this project through grants 12-05-00144 and 10-05-00473.

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Scientific interests:
Conditions of formation of precious metals deposits.
Minerals of variable composition, paragenetic associations of minerals.
Geochemistry of stable isotopes.

GEOCHEMICAL FEATURES OF MANGAZEYSKOE DEPOSIT (SAKHA-YAKUTIA): FLUID INCLUSIONS AND STABLE ISOTOPES

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The Mangazeyskoe depposit is located in the Kolyma-Verkhoyansk fold belt. This deposit is confined to a zone of the Nyuektamin deep fault. Mineralization occurs in Carboniferous to Permian sandstone-shale sequence of the Verkhoyansk complex. Sedimentary rocks are intruded by the Endybal stocks and dykes. Three stages of formation of these deposits were recognized: Au-wolframite-bismuth (GWB), cassiterite-sulphidic (CS) and silver-polymetallic (SPM). Fluid inclusions and stable isotopes were studied for

Fluid inclusions (FI) with size from 2 to 25 mm in quartz and sphalerite from various associations were registered. According to the phase composition at room temperature, inclusions are divide into three types: (1) carbon dioxide-hydrous; (2) gaseous; (3) two-phase gaseous-liquid. FI of type 1 are usually syngenetic to inclusions of type 2, that provide evidence for the heterogeneous fluid state. FI of type 1 were homogenized at 367–217°C, the salinity ranged from 12.9 to 2.0 wt% eq. NaCl. The T_{hom} of inclusions of type 2 was 346–261°C, the CO_2 density ranged from 0.67 to 0.16 g/cm3. FI of type 3 were homogenized to liquid at temperatures from 336 to 126°C the salinity was 18.6–1.4 wt% eq. NaCl (fig. 1a) [1].

An oxygen isotope composition in quartz has been studied. These values from (GWB), (CS) and (SPM) range from -14.9 to +16.4‰, +16.3‰ and +16.7 to +21.8‰, respectively. The $\delta^{18}O_{H2O}$ value estimated for a fluid equilibrated with quartz (at temperatures obtained from fluid inclusions studies) are +2.3…+7.6‰, +8.8‰ and +2.3…+11.0‰ from (GWB), (CS) and (SPM), respectively.

Analyses of the carbon and oxygen isotopes of carbonates were carried out. The $\delta^{13}C$ and $\delta^{18}O$ values of siderite, ankerite and calcite vary from -9.1 to -2.9‰.‰ and +13.7 to +18.4, respectively (fig. 1 b). The obtained data divided on two groups. These groups differ in carbon isotope ratio (-9,1…-6,7‰ and -5,4…-2,7‰), while the $\delta^{18}O$ values are close to each other.

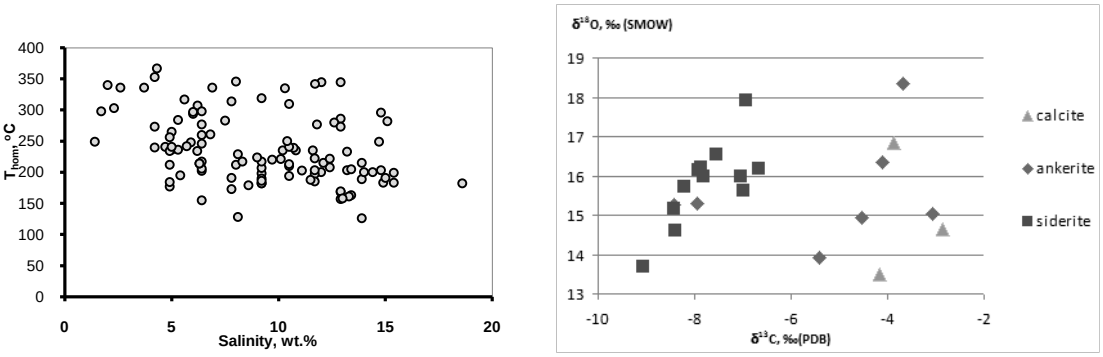

Fig.1. Diagrams: temperature vs. salinity (a) and $\delta^{13}C$ vs. $\delta^{18}O$ (b) for ore-forming fluid (a) of the Mangazeyskoe deposit.

The carried out researches testify to presence in mineral-forming system of Mangazeyskoe deposit two contrast fluids: high-temperature low-salinity fluid with high $\delta^{18}O$ values and low-temperature high-salinity fluid with low values $\delta^{18}O$. Results of studying of stable isotopes allow to speak about participation in mineral-forming two main sources: magmatic (1), matter of host rocks (2) and their mixture in various proportions.

This study was supported by the RFBR (projects 11-05-12017_ofi-m*)*

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THE OZERNOE GOLD-PLATINUM MANIFESTATION (THE POLAR URALS): GEOLOGICAL STRUCTURE, OF ORE MINERALIZATION, GENESIS

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Endogenic platinoid manifestations in chromite-bearing ultrabasites of the Paleozoic ophiolite association have been well known in the Polar Urals for a long time. The platinum group minerals are represented by relatively infusible Ru-Os-Ir–content varieties with secondary Pt, Pd, and Rh. The additional geological study (scale 1:200000) of the territory discovered a low-sulphide copper show in the Kharamatalou river drainage system in 2002. Au and Ag minerals in association with Pd, Bi, and Te ones were established for the first time in the above region's copper ores; Pt minerals were revealed later.

According to a modern viewpoint, the Ozernoe manifestation is confined to the Kershor intrusive complex being a gabbroid part of the Voikar ophiolite complex chiefly. As a result of our investigations, the Dzelyatysher ore-bearing wherlite-clinopyroxene massif (1.0 x 4.0 km in area) was established to be sharply different from surrounding it basic-huperbasic formations in rhythmic sheeting, orientation of primary structures (transversal in relation to the Uralian ones), and peculiar chemical composition of rocks and rock-forming minerals. On the basis of these characteristic features, the massif is considered as similar to laminated plutons and is construed as a fragment of the ancient (Precambrian) sheeted pluton combined with the Paleozoic ophiolite association rocks tectonically [1].

The precious metal mineralization in the Dzelyatysher massif is confined to the olivine pyroxenites taking middle to upper positions in the observed section. Precious metal minerals are represented by Au, Ag, and Pt native formations; Au, Ag, Pt, and Pd intermetallids; arsenides, tellurides, antimonides, and Pt-Pd bismuthides. The natural formations and intermetallids of precious metals, as well as Pt and Pd sulphides, compose little inclusions in initial silicates and ore minerals. The arsenides, tellurides, antimonides, and bismuthides constitute two genetic groups. One of them consists of the substitutional products after native platinoids, intermetallids, and sulphides. The other is characterized by the independent neogeneses in association with secondary silicates and ore minerals.

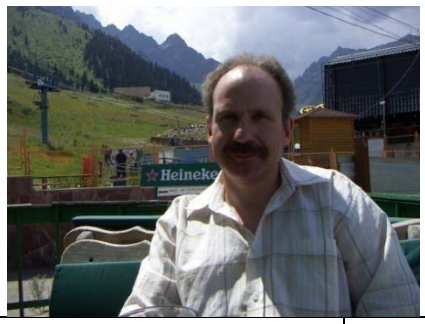
The following model of ore elements formation and accumulation is proposed:

– precious metals and copper were stored in magnesial rocks (high-olivine content clinopyroxenites) during the massif formation;

– hydrothermal-metasomatic processes, which were connected with intruding and cooling of gabbro intrusions, led to the formation and accumulation of Au-Cu sulphide mineralization along the borders on the gabbro intrusions and in zones parallel to them; the same processes resulted in transformation of platinoids into the sulphide type;

– low-temperature alterations of rocks, majorly appearing in their serpentinization, brought to Au and Cu sulphides redistribution; the processes contributed to crystallization of platinoids as arsenides, antimonides, and bismuthides.

1. Low-sulphid platinum mineralization in the Polar Urals / A.M. Pystin, I.L. Potapov, Yu.I. Pystina et al. Ekaterinburg: UrBr RAS, 2011. 152 p.



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Mineralogy, age, and genesis of beryl occurrences at the flanks of the Ural emerald belt, Russia	2009-2012	MSU
Mineralogy of ores and alterations in the Nakhodka porphyry-copper field, Chukchi Peninsula, Russia	2009-2012	MSU
Mineralogy of ores and alterations of the Peschanka giant porphyry copper-molybdenum-gold deposit, Chukchi Peninsula, Russia	2010-2013	MSU
Teaching activity		
Lectures on Gemstone and Precious Metal Deposits	Since 2002	MSU
Lectures on Processing Mineralogy	Since 1998	MSU
Practical lessons on General Mineralogy	Since 1997	MSU
Research project		
Project supported by Russian Foundation for Basic Researches: Mineralogical and geochemical model of large porphyry copper-molybdenum deposits by the example of the deposits in the Chukchi Peninsula	2011-2013	MSU

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THE NEW DATA OF GEOLOGY, MINERALOGY, AND GEOCHEMISTRY OF THE BAIMKA CU-AU TREND, CHUKCHI PENINSULA, RUSSIA

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The Baimka Cu-Au trend is a part of the Oloi metallogenic zone, where Cu-Au-porphyry systems were formed in arc environment. This trend comprises Cu-Mo-Au deposit Peschanka, occurrences of the Nakhodka and Omchak ore fields (in the South) and Yuryakh ore field (in the North) discovered in late 1960th to early 1970th and explored in 1972-1986.. In 2009, prospecting and exploration were renewed in the Baimka trend. As result, the new data obtained indicate a more abundant porphyry mineralization within the studied district of total area more than 1000 km^2.

Geological and geochemical prospecting has revealed new probable orebodies at the Kust property (north continuation of the Peschanka near-meridional ore-bearing fault), Svetly (Omchak ore field, where previously, no copper mineralization was found), and Top' (zone of the Egdygkich NW-trending deep fault).

The Baimka trend comprises Upper Jurassic and Lower Cretaceous stratified volcanic and terrigenous sequences intruded by igneous rocks of various composition and age. Cu-Mo-Au-porphyry systems are related to a few magmatic events.

The intrusion of Late Jurassic porphyry diorite and quartz diorite of the Vesenny complex caused the formation Mo-Cu-porphyry stockworks at the Malysh and Pryamoi properties, and Ag-Au lodes at the Vesenny property (Nakhodka ore field). According to Re/Os dating of molybdenite from Malysh and Pb/Pb dating of sulfide minerals from Vesenny, age of mineralization is 147-149 Ma.

The emplacement of Early Cretaceous three-phase Egdygkich pluton and monzonite and porphyry quartz monzonite stocks of the Egdygkich complex at the margins of the Baimka trend resulted in Cu-Mo-Au deposit Peschanka; similar properties in the Nakhodka ore field (III Vesenny and Nakhodka) and Yuryakh ore field (Luchik and Top'). The Rb/Sr age of the early biotite-potassium alteration at Peschanka is 135.9±6.1 Ma, 139.94±0.50 Ma at property Kust, and 136 Ma at property Nakhodka. According to U/Pb dating of zircon, age of monzonite at Peschanka is 141.8±2 and 138 Ma at property Nakhodka.

Chalcopyrite, bornite, and pyrite are the major ore minerals at Peschanka and similar properties; minor minerals are molybdenite and tennantite-tetrahedrite. Average content of Cu, Mo, and Au is 0.37-0.59%, 11-26 g/t, and 0.10-0.21 g/t, respectively; Cu/Mo =127-391; Cu/Au = 2.6×10^4 - 5.7×10^4.

Mo-Cu stockworks and Ag-Au lodes are located in the Nakhodka ore field at the south of the trend. Molybdenite is the major ore minerals; pyrite and chalcopyrite are permanent. Average content of Mo, Cu, Au, and Pd is 0.1%, 0.07%, 0.22 g/t, and 0.017 g/t, respectively; Cu/Mo = 0.6; Cu/Au = 1.1×10^4. Late Jurassic Ag-Au ores are attributed to the base metal-silver-gold type. The major minerals of the early base metal assemblage are galena, sphalerite, tetrahedrite; the late precious metal assemblage consist of native gold, hessite, petzite, stützite, bogdanovichite (?), phases of the Ag-Te-Se, Pb-Ag-Bi-Te-Se, and Bi-Te-Se systems, pearceite, acanthite, native tellurium, altaite, and clausthalite. Average content of Au, Ag, (Pb+Zn), and Cu in the ores is 2.85 g/t, 56 g/t, 0.9% and 0.15%, respectively. The major admixtures are As (average content 285 g/t), Sb (27 g/t), Cd (28 g/t), Se (up to 63 g/t, and Te (up to 261 g/t). The Ag/Au and Se/Te value is 20 and 0.47.

According to Cu/Au $\leq 4\times10^4$, Late Jurassic Mo-Cu-Au porphyry ores were formed at shallower depth in comparison with that of Early Cretaceous Cu-Mo-Au ores.

Drilling at Vesenny and Pryamoi revealed the transition from Ag-Au lodes to porphyry-copper stockwork at deep level. Mo-Cu-porphyry mineralization exhibited at deep levels of properties in the Nakhodka ore field is important for the reserves growth of copper and provides a forecast of weakly eroded porphyry systems in the Omchak Ag-Au field, where no porphyry-type mineralization was found before.

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Selected work:

1. *Goryachev N.A., Sotskaya O.T., Goryacheva E.M., Mikhalitsyna T.I., Man'shin A.P.* The first discovery of platinum group minerals in black shale gold ores of the Degdekan Deposit, Northeast Russia Doklady Earth Sciences Vol. 439. Part 1, pp. 902-905.

2. Sotskaya, O.T., Manshin, A.P., Goryachev, N.A. New data on the mineralogy of Degdekan ore deposit // II International Geology and Mining Forum Dedicated to Yu. A. Bilibin's 110th anniversary (Magadan, September 3-5), pp 207.

ABOUT MIKROMINERALOGY OF "BLACK SHALE" DISSEMINATED-SULPHIDE ORES OF THE NORTH-EAST OF RUSSIA

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Natalka and Pavlik are main deposits of Omchak ore district (Goncharov et al., 2002). The host rocks are Permian terrigenious sequences. Vetrenskoe deposit is localized in the Triassic sediments, in the zone of large Chay-Yurinskiy fault. Disseminated ores of this deposits are distinguished to the natalka and vetrenskiy types of gold mineralization (Buryak et al., 2001). The study of the heavy fraction of minerals after separation in bromoform was conducted by SEM EVO-50 (Carl Zeiss) with energy dispersive spectrometers and X-ray analysis system Quantax (at magnifications > × 500). In each sample, there were viewed more than 100,000 grains.

Arsenopyrite and pyrite are main minerals of the heavy fraction in considered deposits. Arsenopyrite predominates on the Pavlik deposit, in other deposits its relationship with pyrite varies. It is characterized by prismatic and flattened-rhombic crystals and granular aggregate concretions (mainly for Vetrenskoe deposit). Arsenopyrite is sulfurous and only in Vetrenskoe deposit there are two varieties - sulphurous and stoichiometric. Pyrite is presented by crystals of cubic, pentagonal-dodecahedral shape (dominant at the Natalka deposit) and by isometric grains of irregular shapes (Vetrenskoe deposit). Pyrite content up to 5.9% of As.

Inclusions of native gold have a size from 0.6 to 6 mkm (rarely up to 30 mkm). There have a rounded, sometimes irregular film type morphology grains included in arsenopyrite and As-pyrite. A fineness of gold is 732-886‰ for Natalka deposit and up 831 to 1000‰ for Vetrenskoe deposit. On the Pavlik deposit the native gold were not found, but there we found 14 grains of selenides of Au and Ag – naumanite and fishesserite (?), ranging in size from 0.6 to 2.5 microns in intergrowths with arsenopyrite. The same minerals (4 grains) have been identified on Vetrenskoe deposit, in the same association, too.

Quite often, at the Natalka deposit general minerals of veins are found: chalcopyrite, sphalerite, galena and scheelite. Sulfoarsenides Ni and Co-gersdorffite and cobaltite occur as individual grains and as formed aggregates with pyrite (grain size from 3 to 30 mkm). Also there is noted the presence of individual scales of molybdenite (in size 7-14 mkm) in pyrite. Arsenopyrite and pyrite often contain inclusions of monazite. The presence of galena, and monazite, sometimes in arsenopyrite rarely observed particles of native silver from 1.1 to 5 microns are noted on Pavlik deposit. Galena, monazite, xenotime and rutile in minor amounts are present in Vetrenskoe ore deposit.

Monazite, xenotime and rutile are original host rock minerals, the others were formed during the ore formation. On the one hand, their findings reflect the specificity of ore deposition in concrete deposits, and on the other hand, they reflect possible local fluctuations in the conditions of mineral formation. The first findings in disseminated sulfide ores selenides of Au and Ag, and molybdenite, together with the findings of PGE minerals and Ni and Co (Goryachev et al., 2011), emphasize the "black shale" specific character of this types of deposit.

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THE COMPLEX GEOPHYSICAL INVESTIGATIONS TO SEARCH FOR GOLD DEPOSITS IN THE BURYAT REPUBLIC

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The exploration of gold ore on the territory of the Republic of Buryatia is a complex task. A reliable solutions of this problem by traditional methods like drilling and geological mapping is not always economically profitable. Ujnoe and Smejnoe in East Sayan region are one of the objects of this type.

In the licensed area during the period from 1969-1986 had conducted the geophysical works the methods of self potential, IP with gradient array, magnetic prospecting, applied potential, gamma-spectrometry, electrical soundings and geochemistry. Considering the high level of the geophysical and geological exploration and complexity of geological and geophysical conditions of work (kurums, permafrost, alpine topography, complex geological structure of the ore bodies), it seems inappropriate carrying out to the form areal geophysical and geochemistry a scale of 1:5000 and larger , without making a quantitative interpretation of the data. Has traditionally conducted in this case, the zoning, which has the purpose of selection of the most promising sites on the results of qualitative interpretation of predecessor's data, without using the physical and geological modeling to support the work and does not make a sense.

The use of modern equipment in these conditions with application of galvanic IP it is not optimal, given the scale of previous works scale of 1:10,000, and the presence of large deposits of block, the most promising is the application of pulsed electrical transients using a hardware Impulse-D and non-contact measurement of the electric field Ein-209M equipment and generator GER-50W.

The complex of geophysical methods would solve the problem identifying and delineation prospective of ore bodies, including "Blind" at depths down to 200 meters, clarification elements ore of bedding sites, and tracking the ore bodies to a depth of 200 - 300m, with an estimate of the possibility of further additions to reserves P1; pre-sorting of the geological nature of the anomalous objects obtained.

The use of electrical methods only will not achieve the most precise selection and sorting on the results obtained objects. The solution of the inverse problem for the measured potential (magnetic, radioactivity) and artificial (resistivity, IP) fields allow for a more detailed geological interpretation of the results.

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SYNNYR RANGE NEOPROTEROZOIC MAGMATISM AND PGE-NI-CU-BEARING IOKO-DOVYREN LAYERED MASSIF

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The Neoprotrozoic Synnyr mafic-ultrmafic volcano-plutonic complex is occurred at the south-eastern frame of Siberian platform. It's situated in the Olokit riftogeneous trough which was formed at the boundary of Siberian craton and Baikal-Muya island arc zone in Neoproterozoic. This volcano-plutonic complex includes the Ioko-Dovyren dunite-troctolite-gabbro layered intrusion, plagiolherzolite and gabbro-diabase sills and two suites of volcanics. The Inyaptuk suite represents by high-Ti (2-3 wt. % TiO_2) trachybasalt and rhyolite whereas the Synnyr (probably younger) suite consists of low-Ti (<1 wt. %) andesitic basalt. Temporary relations between these suites are not known exactly because the normal stratigraphic contacts

between them are absent. According Ti-V diagram [3], the basalts of both suite can be classified as continental flood basalt. Andesitic basalt of the Synnyr suite has an aphiric texture and may contain vesicules filled by siliceous and carbonate material and/or sulphides. The average S content at the rocks is 1400 ppm. High Ti-basalts of the Inyaptuk suite have both aphiric and porphiric texture and don't contain sulphide, only titanomagnetite. The average S content at these basalts is less 100 ppm. Rhyolite of the Inyaptuk suite contains remnants of the Pyr (14-15 mol. %) - Alm (70-80 mol. %) garnets. It allows one to assume the acid rock was formed by melting of a crystalline basement of this region. This is supported by lithostatic pressure of 5-6 kbar, calculated by garnet Gd-Dy geobarometer [2]. A numerous remnants of garnet (40-150 μm) have been also revealed in the andesitic basalts of the Synnyr suite but they differ in composition: Pyr – 25 mol. % ; Alm – 49 mol. %; Gross – 24 mol. %. Such enrichment by pyrope compound may indicate that the Synnyrsky basalts source was contaminated by lower crustal materials at the greater depths as the Inyapuk rhyolite was melted.

The Synnyr rocks are is characterised by positive Pb and negative Ta, P, Ti anomalies on the mantle-normalised diagram, similar to rocks with crustal contamination. Ioko-Dovyren gabbro-norites display similar geochemical patterns indicating a probable genetic link with the Synnyr volcanics. The Inyaptuk suite is differ from the Synnyr volcanics by higher Gd/Yb values, positive Ti and lacking of negative Ta anomalies. These geochemical differences are confirmed by the Sr and Nd isotopic data. The average $^{87}Sr/^{86}Sr$ and $^{143}Nd/^{144}Nd$ ratios of Inyaptuk basalts are 0.705 and 0.5126, whereas the Synnyr andesitic-basalts demonstrate 0.707-0.713 and 0.5116, respectively. Ioko-Dovyren $^{87}Sr/^{86}Sr$ and $^{143}Nd/^{144}Nd$ ratios are varied 0.709-0.715 and 0.5114-0.5118. Melting trend generated the Inyaptuk rocks was estimated ~10-25% mantle melting using Gd/Yb vs La/Sm diagram [4]. Synnyr volcanics follow a trend towards the composition of the Lower Crust, indicating the significant extent of crustal contamination and suggesting ~30% melting of the mantle source.

Similar to other Large Igneous Provinces containing sulphide PGE-Ni-Cu deposits, Neoproterozoic Synnyr Riftogeneous Trough includes two types of volcanic rocks – low-Ti andesitic basalts and high-Ti subalkali basalts. Geochemical characteristics of the Synnyr volcanics suggest the significant contamination by the Lower Continental Crust, whereas Inyaptuk volcanics lack any prominent fingerprints of contamination. These data evidence for a genetic link between the Ioko-Dovyren layered intrusion and the low-Ti andesitic basalts of the Synnyrsky suite. We believe that in the Neoproterozoic time, the Ioko-Dovyren intrusion was formed during solidificationof initially open magmatic system serving as magma-staging chamber for the Synnyrsky volcanics. This is evidenced by a system of gabbro-diabases sills occurring between the layered massif and the overlapping Synnyr volcanics.

Baddeleite dating of the Synnyr-Dovyren volcano-plutonic complex gives the age 730±5 Ma. According the palinspastic reconstraction, the southern Siberia in this time could be united with northern Laurentia where the gigantic Franklin LIP located [1].

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PLACER PLATINUM CONTENT OF SOUTH-EAST RUSSIA

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The South-East of Russia (SER) occupies the space to the south of the Siberian platform and to the south of Baikal up to the coasts of the Okhotsk and Japanese seas. The region is also characterized by the presence of the Pre-Cambrian rift structures with manifestations of the alkali-basalt, alkali-pycrite, and carbonatite magmatism, the Phanerozoic bimodal volcanic and gabbro-granite series, granitoid batholiths, and abundance of lamprophyre dikes. The listed magmatic associations are the type elements in the models of the deep-seated plume evolution and are taken into account by petrologists in distinguishing the North-Asian superplume (NAS) on the territory of SER. Its influence areal covers the eastern flange of the Central-Asian orogenic megabelt and restricting it in the north and south marginal parts of the Siberian and Chinese-Korean cratons. The superplume projection is almost in full in line with the province of the newest intraplate magmatism of East and Central Asia. The denoted boundaries are traced by the deep-seated faults rather distinctly visible in the geophysical fields as the gradient zones of the gravity field [1].

The most known ore-placer occurrences of the platinum group elements (PGE) are concentrated in the northern segment of the North-Asian superplume projection perimeter. On the eastern and south-eastern periphery of the superplume projection the platinum and gold placers are also found. In the central part of the region there are also a considerable number of the placers of platinum group minerals (PGM). The obvious conformability of the boundaries of the gold and platinum-bearing areas to the NAS contours testifies the possibility of a new approach to the interpretation of the available geological, geophysical, geochemical, and mineragenic data on South-East Russia for the improvement of the main factors' role that influenced the distribution of the precious-metal mineralization in the region. Correlation of such data shows that the conditions favorable for the development of placer platinum occurrences in the region were resulted from the plume magmatism of several generations [2]. It was responsible for the origination in the Neo-Archean, Proterozoic, and Phanerozoic time of the layered zonal ultramafite-mafite massifs undergone in the Late Paleozoic and Mesozoic the action of the granitoid formations of the "mottled composition", that provided the development of the ore-forming magmagene-fluid-metasomatic processes. The geological-petrological and physicochemical conditions most favorable for the PGE concentration were generated in the places where granitoid formations were superposed on the mafite-ultramafite massifs and ophiolitic complexes arisen earlier. The sources of large and unique placers in the northern and eastern marginal parts of the NAS influence areal were the ring (zonal) alkali-ultrabasic platinum-bearing massifs been activated in the Cretaceous time. When taken into account that in the places, where the NAS granitoid derivations influenced the layered ultramafite-mafite plutons, the conditions could be arisen favorable for ore-forming processes, then particular emphasis should be placed upon the endo- and exocontact areas of the contacting Pre-Cambrian, Paleozoic, and Mesozoic massifs (even the economically important platinoid placers are absent) for the estimation of the platinum content of the contact zones.

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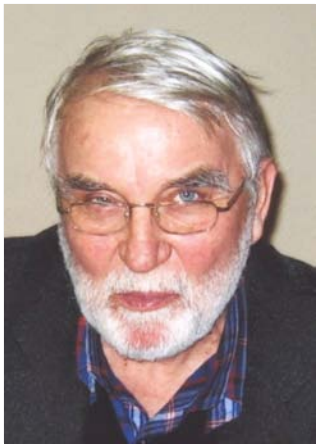

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ANORTHOSITE-RAPAKIVI GRANITE COMPLEXES OF THE FENNOSCANDIAN AND UKRAINIAN SHIELDS AS A RESULT OF WITHIN-PLATE MAGMATIC ACTIVITY UNDER CONDITIONS OF VERY THICK SIALIC CRUST

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Classic location of anorthosite-rapakivi granite complexes (ARGC) 1.7-1.5 Ga age are specific magmatic associations is the western part of the basement of the East-European Craton, where they form a huge (about 2,000 km long) belt of batholiths. It occurs mainly within the Svecofennian domain, which was formed on the place the Svecofennian orogen, and partly in the western part of the Ukrainian Shield, strongly reworked by the Svecofennian processes about 2 Ga. The feature of the western part of the East European Craton is unusually large thickness of crust, in places reached 50-60 km. ARGC are absent to the east from the Svecofennian domain, where ancient Archean crust of normal thickness (about 40 km) predominated (Kola-Karelian, Volga-Urals, etc. terranes).

ARGCs are large multistage batoliths which formed during 20-25 Ma [1]. They are composed mainly by anorthosites and granites where the latter predominate. Sometimes, in certain portions, they look like as coarse-layered intrusions with graduate transition from anorthosites via norites, monzonites and diorites to granites (Salmi, Ahvenisto, Korosten, etc. massifs). According to geochemical and isotopic data, primary magmas of rapakivi granites derived from crustal material and anorthosites – from mantle-derived melts, contaminated by crustal material. Diabase dykes are closely associated with anorthosite-rapakivi granite complexes. The dykes often intruded during the process of the ARGCs formation, as it follows from cross-cutting relations with granites and vice versa and mingling phenomena. These dykes originated from Fe-Ti basalts, demonstrating that formation of anorthosite-rapakivi granite complexes occurred simultaneously with melting of mantle source beneath them.

It suggests that origin of the ARGC was linked with ascending of mantle plumes under condition of very thick (70-80 km in the moment) continental crust. As a result, a large amount of newly formed basaltic magmas was trapped within sialic crust in form of large sill-like bodies with vast melting areas above them. Structure of such magmatic systems suppose co-existence of mafic and sialic melts in large magmatic chambers, which led to partly contamination of mafic melts by crustal material and enrichment of sialic melts by alkalies, especially, potassium [2, 3]. Consequently, crystallization of contaminated mafic melts was led to appearance of anorthosite bodies, and sialic melts to K-enriched rapakivi granites. Solidification of such bimodal magma chambers occurred upwards – mafic melts hardened firstly, and sialic - later. It suggests that such situation, when solidification of sialic layer took place above still hot mafic rocks was led to appearance of specific ovoidal rapakivi granite textures. Ascending of magma currents in heated below layer of silicic magmas periodically lifted up light K-feldspar crystals; they partly dissolve in hot inner parts of chamber, sinking with recommence of growth, lifted again, and so on. As a result, specific concentric-zoning ovoids appeared, which finally settled at the chamber's floor, forming rapakivi texture.

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Scientific interests:
Ag-Pb-Zn and Au-Ag ore deposits mineralogy and geology.
Formation regularities and working out the criteria of their projection.

MINERAL PARAGENESIS AND LOCALIZATION CONDITIONS OF ORES OF SILVER DEPOSIT TAEZHNOE

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Epithermal silver deposit Taezhnoe is located in the Eastern Sikhoto-Alin volcanogenic zone, Primorye. The deposit was mostly studied in the range of silver challenging areas of the central part of Terneysky ore district: Pihtovoe, Kumirnoe, Kabanye, Kyshmyshovoe, Taratai, etc. Silver mineralization is joined to the territorial part of large intrusive-domal structure in multi-compounded vulcanites. Intrusive bodies of granite - granodiorite composition with tin-polymetallic and polymetallic mineralization prevail in the central part of the structure. Silver and tin-polymetallic mineralization of the district is space-discrete, but partially there is also a co-location observed. Mineralization differs according to the geological-genetic conditions of formation, the time of formation and presents of different ranks magmatogene-ore-bearing systems.

Mineralogical-geochemical features of ores and typomorphic properties of minerals of zones Malahitovaya and Iulskaya – challenging from genetic and industrial views are investigated. There were the following analyses such as spectral, chemical, assay, mineralogical, petrographic, mineragraphic and thermogravimetric ones performed. The quantitative composition of concentrators-minerals and silver bearing minerals is defined on scanning electronic microscope TESCAN of series VEGA with power disperse prefix INKA and chemically on Hitachi-150, Solaar M6.

It is revealed that the ore mineralization occurs in vein formations, in silicified brecciated rock and is connected with quartz and adularia-carbonate-quartz veinlets. Periores argillizites are presented by hydromicas and illite. Silver minerals of ores are the main industrially valuable and contain no more than 25 % from the ore. The following uneven-age mineral associations are defined: 1) pyrite-I-quartz; 2) galenite-sphalerit-chalkopyrite-pyrite-II with arsenopyrite; 3) freibergite-akanthite-polybasite-pyrargyrite with gold. All mineral associations are spatially overlapped in ore bodies. The basic silver carrier in ores is pyrargyrite, silver minerals are rarer: polybasite, stephanite, argentite, akanthite, freibergite, diaphorite, andorite, freieslebenite with various content of Ag, Cu, Fe, Pb, Sb, Se and native silver. Silver extremely irregular concentrates in vein and sulfide minerals as micro-dissemination of silver minerals. The productive mineral complex of the investigated deposit is comparable to mineral paragenesis of epithermal deposits: Kyzylalma (Uzbekistan) and Ducat (North-East).

For the first time we revealed the considerable content of native gold in the flotation tailings and in quartz veins on flanks of the basic ore bodies (to 20 g/t); rare grains of platinoids (breggit, sperrylite, osmiridium) in a concentrate. The content of Os in the enriched ore is 2 g/t; in flotation concentrate Pt - from 0,374 to 1,45 g/t; Pd - from 1,12 to 2,00 g/t, in pyrite of zone Iulskaya Pt - 1,104 g/t, Pd – 0,232 g/t.

The conducted researches enabled to refer the deposit to a gold-silver epithermal type with a platinoid mineralization. Discovery of non-traditional from the metallogenetic positions ore structures in the Eastern Sikhoto-Alin volcanogenic belt enhances the retrospectives in regard to detection of new industrial objects in Primorye.

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Present Position

Chief Research Scientist of Diamond and Precious Metal Geology Institute, Siberian Branch of the Russian Academy of Sciences.

Qualifications

1962 – Graduated from geological-prospecting faculty of the Leningrad Institute of Mines
1971 – PhD degree in Geology and Mineralogy
1991 – Doctor of Geological and Mineralogical Sciences

History

1962-1965 – the geologist of the Yakut Central searching-prospecting expedition
1966-2012 – Junior Scientific Worker, Senior Scientific Worker, Head of Laboratory, Chief Research Scientist of Diamond and Precious Metal Geology Institute, Siberian Branch of the Russian Academy of Sciences (DPMGI SB RAS)

Scientific interests:

Study of petrology and geochemistry of magmatic rocks in different geodynamic settings (regions of studing: Verkhoyansk-Kolyma area).

Selected work:

Trunilina, V.A., 1992. Geology and ore content of Late Mesozoic magmatic formations in northeast Yakutia. Novosibirsk: Nauka, 257 p. (in Russian).

Trunilina V.A., 1994. Geodynamic position, genesis and criteria for ore content of tin-bearing granitoids from the Yana-Kolyma region. In: Metallogeny of collisional orogens. Czech. Geological Survey, Prague, p. 430-434.

Trunilina V.A., Roev, S.P., Orlov, Yu.S., and Oxman, V.S., 1999. Magmatism of various deodynamic environments (zone of junction of the Verkhoyansk margin of the Siberian continent and the Kolyma-Omolon microcontinent). Yakutsk: YaNTs SO RAN, 168 p. (in Russian).

Trunilina V.A., Roev, S.P., Orlov, Yu.S., 2007. Volcanic-plutonic belts of North-East Yakutia. Yakutsk: YaNTs SO RAN, 168 p. (in Russian).

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Qualification:

1996 - phd of geology;
1975 - geological faculty YaSU (Yakutsk).

History: 1975 –2012 - Junior Scientific Worker, Senior Scientific Worker of Laboratory of Ore Deposits and of Regional geology and geodynamic labs.

Scientific interests: Study of geochemistry, mineralogy and petrology of magmatic rocks in different geodynamic settings of Eastern Yakutia. Specialising in the investigations of rocks, magmatic and accessory minerals of various magmatic rocks of different geochemical types.

Selected works:

S.P. Roev. Mineralogy of granitoids of Derbeke – Nelgekhe intrusive row and his genetic aspects. – Yakutsk, publisher of YSC SB RAS, 1997. 104 p.

RELATION BETWEEN BASIC AND ACID MAGMATISM IN TIN-BEARING AREAS OF EASTERN YAKUTIA

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Tin-bearing deposits of the region are localized in endo- and exocontact zones of exposed granitoids. The granodiorite-granite formation (IS-type granitoids of continental arcs) have associated boron-tin deposits. According to petrological estimates, the parent melt was derived from crustal substrata of dacite-tonalite composition at 1000-1100^{o}C. Granitoids of the diorite-granodiorite-granite formation (I-type granitoids from extension zones of the thick continental crust in the inner areas of the Verkhoyansk continental margin) bear cassiterite-sylfide deposits. Magmatic chambers were initiated in the lower crustal amphibolites and at the crust-mantle boundary at P up to 10 kbar and T = 1060-1200^{o}C. This was followed by the upward migration of the magmatic chambers to higher crustal horizons and by mixing of basic and acid melts. Granitoids of the latitic series (L-type granitoids of the zones of continental –marginal extension) and of the anorogenic A-type granitoids have associated complex Sn-As-Au-Pb-Sb-Bi deposits. The parent melts for the L-type granitoids were formed from partial melting of the lower crustal amphibolites at P=10-12 kbar and T=1200-1250^{o}C. The parent sialic melt for the anorogenic granites.was generated from the crustal substrata at P about 8 kbar and T=900-950^{o}C. In the course of evolution they both constantly experienced the effect of deep-seated fluids associated with highly alkaline basaltoid magmas and interacted directly with basic melts. have associated complex Sn-As-Au-Pb-Sb-Bi deposits. The cassiterite-quartz and tin-rare metal deposits occur in syn-collisional S-type granites in the upper crust. The parent melts were generated at P=5-6 kbar and T=800-850^{o}C.

The average size of a geothermal gradient does not exceed 30^{o}C/km. It is reduced up to 15-20^{o}C/km for amagmatic regions of the Chersky Range. Accordingly, an additional heat sourse was needed for the protolith to begin melting under estimated conditions. This could be local mantle diapers of which the derivatives immediately predate the emplacement of IS- and I-type granitoids and predate and immediately follow the emplacement of L- and A-type granitoids. As this takes place, compositions of basic melts change from tholeiitic calc-alkaline to subalkaline and K-alkaline, the depth of magma generation varies from 36-40 to 60-75 km, the temperature of the melts from 1100 to 1400^{o}C, and La/Yb ratio from 2-4 to - 40-70, with the Yb content ranging from 2,3-4,2 to 1,8 ppm. This indicates the composition of the protolith changed from primitive spinel lherzolites to intensely metasomatized lherzolites [1].

It is established that L- and A-type granitoids and associated basic rocks show the same geochemical specialization for Sn, W, Bi, Sb, As, Ag, Bi and Li and that in both of them tin correlates with volatiles and ore elements. This implies that the basic melts generated in the metasomatized mantle were also an additional source of ore elements.

Thus, the levels of magma generation upon granite formation and, hence, the petrotype of granitoids and the formational affinity of the associated tin mineralization were largely controlled by compositional parameters of the mantle diapirs ascending to the crust.

1. Drill S.I., Kuzmin M.I., Tsipukova S.S., Zonenshain L.P. Geochemistry of basalts from the West Woodlark, Lau and Manus basins: implication for their petrogenesis and source rock composition // Marine Geology, 1997, v. 142. P. 57–83.

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Present Position

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Field of Scientific Research

Ore mineralogy of porphyry deposits. Mineral thermodynamics and the behavior of minerals in geochemical systems. Research and development of experimental approaches to understand metamorphic processes.

MINERALOGY OF PROPILYTE OF THE PESCHANKA PORPHYRY-COPPER DEPOSIT, CHUKCHI PENINSULA, RUSSIA

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The Peschanka deposit located 250 km southeast of Bilibino, in the eastern part of the Early Cretaceouslarge polyphasic Egdygkych pluton is the largest porphyry copper deposit in Russia. Mineralization is hosted in the potassic and phyllic alteration, which are surrounded by halo of propylitic rocks. The aim of this study is to describe a mineralogy of propylite of this deposit because of the absence of the data of thise metasomatic rock at porphyry-copper deposits worldwide. Propylite is composed of epidote, albite, potassium feldspar, quartz, amphibole, chlorite, and tourmaline. Accessory minerals are rutile, titanite, calcite, prehnite; ore minerals are pyrite and magnetite.

Amphibole from propylite occurring as irregular crystals is presented several generations. The earliest magnesihornblende (0.32 – 0.50 apfu Na, 0.09 – 0.12 apfu Ti, up to 0.08 apfu K) replaces primary magmatic diopside. The $Mg/(Mg+Fe^{2+})$ (Mg#) value in the mineral ranges from 0.78 to 0.95. In turn, it is replaced by tremolite-actinolite hornblende (0.23 – 0.37 apfu Na, 0.03 - 0.11 apfu Ti, up to 0.05 apfu K, Mg# 0.81 — 0.95). The latest tremolite-actinolite (0.07-0.27 apfu Na, 0.04-0.05 apfu K, up to 0.03 apfu Ti, Mg# 0.60-0.92) replaces earlier amphiboles. All amphiboles contain an admixture of Mn (up to 0.11 apfu)

Epidote replaces primary plagioclase and diopside, develops along cleavage of biotite, and is simulteneus with tremolite-actinolite hornblende.

The crystals of epidote are complexly zoned because of different Fe^{3+} content ranging from 0.648 to 0.993 apfu.

Metasomatic potassium feldspar (KFS) replaces primary magmatic potassium feldspar and crystallizes simultaneous with albite and quartz. In contrast to magmatic potassium feldspar, the metasomatic KFS is characterized by absence of albite exsolution lamellas and contains up to 7.3 wt. % of BaO.

Tourmaline can be classified as an intermediate member of the “oxydravite”–povondraite series with the Fe → Al isomorphic substitution typical of porphyry style deposits.

Chlorite is the latest mineral of propylite. It occurs in the central parts and flanks of the deposit and is present several generations. Chlorite I from the central part is comparatively low Fe ($Fe\# = Fe_{total}/(Fe_{total}+Mg)$ 0.29-0.30) with2.20-2.31 apfu Al. Chlorite II, occurring along cleavage of chlorite-I, occurs as zoned crystals. The Al content and Fe# value in chlorite II increase to the flake from 2.21 to 2.46 apfu and from 0.35 to 0.46, respectively. Chlorite I at the flanks of the deposit is characterized by a wide variation of Al content (2.07-2.28 apfu) and Fe# value from 0.22 to 0.30. Later chlorite II with Fe# value of 0.30 to 0.40 at flanks of the deposit develops along cleavage of chlorite I. The Al content varies from 2.19 to 2.36 in the central part and from 2.16 to 2.39 in the edge of flakes. Thus Al concentration in clorite decreases from deposit center to its flanks, testifying to the decreasing temperature of crystallization.

As a result the evolution of chemical composition of amphiboles of propylite from early magnesihornblende through tremolite-actinolite hornblende to the latest tremolite-actinolite was established; the difference in composition between central and flank chlorites due to decreasing temperature of the formation of propylitic alteration toward flanks is shown.

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1987 . Leading geologist;
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History:: 2007 - till now - Representative of Russian Copper Company (RCC) - in RFE
1992 - 2007 Geologist of Gold Companies: AMUR, NP-Centre, Ros-DV, Golden League
1979 -1992 Geologist of Tayozhnoe PGO (GEOLOGORAZVEDKA Concern): Special Prospecting and Forecasting Research in few regions of Russian Far East and North-East

Professonal and Scientific interests:
Geology and Metallogeny of Uranium, Base and Precious Metals, Regional Metallogeny.
Invest Projects development for Base and Noble Metals searching and prospecting (RFE).
Discovery, Geology and Metallogeny of Cosmogenic Structures in Pacific wide Region.

Selected work /articles:

L.B. Sushkin Some geological features of Kolchedanny Utyos gold deposit (East Stanovik) // Khabarovsk, Dalnedra, 1991, N 1, pp. 171 - 178.

L.B. Sushkin Geology and ore prospects of Sologu–Chaydakh gold ore field (Eastern Stanovik) // Tikhookeanskaya Geologiya, 2000 – Vol. 19, N 1, P. 56 - 65.

L.B. Sushkin Specific features of native elements at the Kondyor deposit // Geology of Pacific Ocean, 1996, Vol. 12, pp. 915–924. OPA. Harwood Academic Publishers GmbH Amsterdam B.V.

L.B. Sushkin On cosmogenic origin of Khabarovsk ring structure// Science and Nature of Far East. 2004, N 1. p. 92-105. Ref.:36. Priamurskoe Geographic Society. Khabarovsk.

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L.B. Sushkin On prospecs of gold ore potential of North -West Sikhote - Alin // Mineralogical Research and Mineral Resources of Russia. RMS Meet. Abstracts. Moscow, 2007, p. 140 –143.

L.B. Sushkin Mineralogical - geochemical features of Bolotisty gold ore field (West Sikhote – Alin). Tectonics and metallogeny of the Circum - North Pacific and Eastern Asia: Proc. of the Leonid Parfenov Memorial Conference, Khabarovsk, ITiG FEB RAS, 2007. p. 546 – 547.

L.B. Sushkin Main features of large Late Mesozoic Khabarovsk Astroblem "Dersu" Proc. of the Victor Khain Memorial Conference, Abstracts. Moscow, MSU, 2011.

L.B. Sushkin On platinum ore potential of Sooly – Tormasu ore district (West Sikhote – Alin). Tectonics, ore deposits and deep structure of the Earth crust: Proc. of the Svyatoslav Ivanov Memorial Confer., Abstracts. Yekaterinburg, IGG UrBr RAS, 2011. p. 266 – 269.

ON PORFYRY TYPE ORE POTENTIAL OF SIKHOTE-ALIN PROVINCE (RFE)

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Porphyry-type deposits are one of the main sources of copper and molybdenum in many countries. In the south of the Russian Far East several types of calc-alkaline magmatism belts are recognized that either host or have the potential for porphyry-type mineralization including volcano-plutonic belts of active continental margins, i.e. East-Sikhote-Alinsky, West-Sikhote-Alinsky in particular. Let's consider some main known porphyry-type objects.

Eastern Sikhote - Alin Nochnoye gold – copper occurrence

Position in regional geological structures. The territory was traditionally considered as part of the Eastern Sikhote-Alin synclinorium of the Sikhote-Alin geosyncline-folded system.

The most important magmatic structure of the area is the Sandinskoye magmatogenic-arched uplift. In its northern part is located the Byuleneisky volcano-intrusive local dome. An intrusive dome of the Nochnoi stock occurs in the north-western part of the Byuleneisky dome. Mineralization is localized in hydrothermally altered granite-porphyries of the southern endocontact part of the Nochnoi stock.

Hydrothermal-metasomatic formations of the occurrence are comprised of greisen-type metasomatites, quartz-sericite metasomatites, potassium-silicate metasomatites, propylites, and quartz-kaolin-hydromica metasomatites. As a result of previous studies at the Nochnoye occurrence Yuzhnaya and Severnaya ore-bearing structures were recognized. Within these structures, local zones of vein-disseminated mineralization were located.

Mineral composition of the ores is as follows: quartz , biotite, feldspar, chalcopyrite , bornite, covellite, pyrite, sphalerite. Also recorded are fahlores, molybdenite, cassiterite, wolframite, galena, and magnetite. Secondary minerals are malachite, azurite, and green copper oxides. Nineteen ore minerals are recognized in the ores.

Resources of the target were assessed in the past based on the better understood Yuzhnaya zone. Total copper resources of Nochnoye occurrence for the target are 729 thousand tons with 0.25 % Cu on average that are concentrated in 292 million tons of ore, 467 thousand tons (64 %) averaging 0.41 % Cu. Total silver resources for the target are 3.6 thousand tons. Total resources of gold for the target are 3.9 tons (Sitnikov et al, 1993, arch.). So potential resources (oxidized ores) of the target are assessed in the past at the level of a medium-size deposit. It is not improbable that rich ore occurs at depth 50-350 m (in the zone of secondary sulfide enrichment and horizons of non-oxidized ores).

Western Sikhote - Alin Malmyzh gold – copper large porphyry system

At the last years one of the most prominent achievements in Western Sikhote – Alin was an acknowledgement before depth 500 m by Canadian «Fortress Minerals Corp.» .large Malmyzh gold-copper porphyry system located in Khabarovsk Territory 200 km northwest from Nochnoye occurrence. It was known since 1960s -as a Au-Cu anomaly, then occurrence.

The Malmyzh occurrence and its flanks are made up of Upper Cretaceous terrigenous formations intruded by the porphyry-like granodiorite-diorite intrusion. Hydrothermal-metasomatic formations of the occurrence are comprised of quartz-type metasomatites, quartz-sericite metasomatites, carbonate metasomatites and propylites. Ore formations of the occurrence are localized mainly within the outlines of metasomatite zones of quartz-sericite and quartz-magnetite metasomatites. Mineral composition of the ores is as follows: pyrite, chalcopyrite, bornite, chalcocite and covellite. Gold mineralization is restricted to the zones of quartz-magnetite metasomatites and later quartz veins also. Eastern part of the occurrence has prospects for discovering a zone of secondary sulfide enrichment. Copper grades average 0.3 % and 0.5 %. Total copper resources of Malmyzh system are valued in more 5 millions tons !

The significant prospects also related with many porfyry systems in Russian Primorye !

ON NOBLE METAL POTENTIAL OF CENTRAL SIKHOTE-ALIN FAULT ZONE

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At the last 20 years were received important prospecting geological results, allowed to elaborate the beliefs about noble metal potential of north part of West Sikhote – Alin region. It was closely related with exploring works in Bolotisty gold ore field in Right - Sooly golden node, within Sooly - Tormasu potentially ore district [1].

The territory was traditionally considered as a part of the Western Sikhote - Alin synclinorium of the Sikhote - Alin geosynclines - folded system (Martynyuk, 2010, archive).

In geological attitude Sooly - Tormasu ore district belongs to West - Sikhote - Alin structural - formation zone. In structured plan it found within West - Sikhote - Alin sinclinorium, which is assessed of West - Sikhote - Alin volcanic zone tracking along Central Sikhote - Alin Fault (CSAF) on 300 km at width 20-45 km. Some data shows on riftogenical origin of this very long regional lineament.

A Right - Sooly placer - ore golden node genetically related with volcano - plutonic dome of the central type, distinctly expressed in relief, river hydrosystems - in the manner of the complicated telescopic morfostructure, as well as on geophisical and geochemical data.

High depth of this structure indicates by the results an MTZ geophysical flexing, according to which its root parts reach depths 300 - 400 km in upper mantle [1].

About mantle origin of magmatic centre witnesses the development in central part of Bolotisty gold ore field specific turmaline alteration, which are a sign of the intensive influence on the rocks of deep boron - hydrate fluids, possible, of the mantle origin [1].

The main element - a companion (satellite) gild in ore are a silver, copper, tin, zinc, lead, molybdenum, less bismuth, arsenic and stibium. Herewith, the important gechemical particularity of gold mineralization is the sharp prevalence of the cobalt on nickel. Considering installed in native gold of the ore field significant admixture copper and palladium, presence in ore mineralization most native copper with high admixture of gold and palladium separate study needs an important question about prospect of the discovery here PGE and gold - copper – platinum mineralization, revealled as a whole row regions of Cenozoic basalt magmatism (Shanuch Cu - Ni - Co - PGE ore field in South Kamchatka).

As to its nearest analogue, that it is Lazurnoye Au - Cu deposit in Soboliny ore node (Primorsky Krai), located on opposite east border of Central Sikhote -Alin Fault (CSAF).

Like Bolotisty gold ore field - Lazurnoye Au-Cu deposit also closely related with Late Cretaceous stock of porphyry-like diorite–gabbrodiorite intrusion. Mineralization is localized in hydrothermally altered rocks of the endocontact and ekzocontact parts of the Lazurny stock. Hydrothermal-metasomatic formations of the deposit are comprised of potassium-silicate and quartz metasomatites. Total copper resources of Lazurnoye deposit for the target are 500 thousand tons. Very important feature of Lazurnoye deposit Au-Cu ores is high concentrations of gold (average 64,8 g/t) and PGE. Platinum grades average 2,17 g/t (max. 9,34 g/t), and palladium 1,03 g/t (max. 2,96 g/t).

Generality of structural control both of Bolotisty and Lazurny deposits allows to put questin about noble metal (Au and PGE) prospects of whole wide CSAF (or Rift ?) zone [2].

1. Sushkin L.B. Mineralogical - geochemical features of Bolotisty gold ore field (West Sikhote - Alin). Tectonics and metallogeny of the Circum - North Pacific and Eastern Asia: Proc. of the **L**eonid **P**arfenov Memorial Conference, Khabarovsk, ITiG FEB RAS, 2007. p. 546 – 547.

2. Sushkin L.B. On noble metal ores in Central Sikhote - Alin fault zone. Tectonics, magmatism and geodynamics of East Asia: Proc. of Academician **Y**ury **K**osygin VII All-Russian Memorial Conference, Khabarovsk, ITiG FEB RAS, 2011 p. 220 - 223.

METALLOGENY OF KHOR-ANYUISKY WATERSHED (SIKHOTE-ALIN)

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The territory of research was traditionally considered as part of the Central Sikhote -Alin anticlinorium and West -Sikhote -Alin volcano-plutonic belt /Martynyuk, 2010 archive/.

Geological structure of the area is comprised of Triassic-Cretaceous siliceous-volcanogenic-terrigenous deposits, Lower Cretaceous terrigenous deposits, Upper Cretaceous and Neogene volcanic rocks. The Perm siliceous-volcanogenic-terrigenous deposits takes up the entire central part of the area, in Pody - Mezhdugornaya rivers basin especially.

Magmatic formations in the area are comprised of the Tardoky -Yany massif of granites and Late Cretaceous dykes, Late Cretaceous-Early Paleogene and Paleogene granitoids, Neogene dolerites, gabbrodiorites and ultrabazites. Geology of the area are anologeus to such well known precious and base metal provinces as Urals, Russian North - East and Alaska !

The Bolotisty gold occurrence occurs at the western part of Khor -Anyuisky watershed. Mineralization is localized in hydrothermally altered volcano-sedimentary rocks and gabbrodiorite of the southern ekzo- and endocontact part of the Bolotisty stock (S - 1,8 km^2).

According to gravity survey data, the occurrence is located on edge part of the gravity anomaly corresponding to the long zone of bazification striking north-east for more than 50 km. In the zone are abundant deposits of rare metal and base metal mineralization. In infrared spectroscopy data the ore field of the Bolotisty occurrence is recognized by low values of potassium (up to 1,5 - 2.5 %), and anomalous concentration of uranium and thorium. Elevated potassium and uranium are very important exploration indicator of gold -silver mineralization. Total gold resources of Bolotisty ore field are valued now in more 100 tons [1] !

In Left - Tormasu ore node were are else discovered some weakly studied gold occurences (Kvartsevy, Solnechny, Upper Tormasu), that situated north-east from Bolotisty.

According to airborne spectroscopy survey data the most contrasting aoreoles of potassium (4 - 5 %) are discovered in upper part of Sooly, Tomchy and Pody river basins. These basins require the most careful examining. According to gravity survey data, this area is located within the large gravity low corresponding to the wide zone of granitization. In the area are abundant occurences of rare metal, precious (Au, Ag) and base metal mineralization.

As a result of previous studies at the central part of area Talyuke (Bi-Au-W) and Afrodita (Au-Sn), Udzhaky (Ag), Solekul (Bi), Barakhta (Se) ore occurrences were recognized. Within these occurrences local zones of strings and vein - disseminated quartz - sulphide mineralization were located.

Hydrothermal-metasomatic formations of the occurrences are comprised of greisen-type metasomatites, quartz - sericite metasomatites, potassium - silicate metasomatites and others.

Mineral composition of the ores is as follows: quartz, biotite, feldspar, pyrite, chalcopyrite, pyrrotine, arsenopyrite, bornite, chalcosite, sphalerite. Also recorded are fahlores, molybdenite, cassiterite, wolframite, galena, and magnetite (near 15 ore minerals). Small intrusions of Taluke and Afrodita occurrences are analogeus to Bolotisty field stock.

Considering broad development in Bolotisty ore field and crowd relationship of gold with bismuth tellurides [1], - Solekul (Bi) and Barakhta (Se) occurrences and its flanks also must be carefully examined for gold - silver ore and placer mineralization. It seems very important because near 2000 there were discovered some gold ore samples of industrial grade (0,8 - 3 kg/t) !

1. Sushkin L.B. On prospecs of gold ore potential of North - West Sikhote - Alin // Mineralogical Research and Mineral Resources of Russia. RMS Meeting. Abstracts. Moscow, 2007, p. 140 –143.

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Present Position

Head of Department of Geochemistry of Endogenic Processes of the Institute of Geochemistry, Siberian Branch of the Russian Academy of Sciences.

Career Synopsis

1964 Graduated from Irkutsk State University
1964 – 2012 Junior Scientific Worker, Senior Scientific Worker, Chief Research Scientist, Head of Laboratory and Department of the Institute of Geochemistry SB RAS.

Academic Qualifications

1970 – PhD degree in Geology and Mineralogy
1987 – Doctor of Geological and Mineralogical Sciences
2011 – Reward: Honoured person of Science of Russian Federation

Field of Scientific Research

Study of geochemistry and petrology of magmatic rocks in different geodynamic settings (regions of studing: Transbaikalia and Baikal area, Mongolia, Kamchatka).

Specialising in the investigations of granitoids of different geochemical types and related mineralizations.

Field of Teaching

Head of chair of Geochemistry of Irkutsk state University.

Instruction and practical training of students and postgraduate students on Geochemistry and Petrology of granitoids and other magmatic rocks. The lectures at this topic have been given in Irkutsk and Mongolia.

Selected work:

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RARE METAL GRANITOIDS OF BAIKAL AREA AND MONGOLIA: GEOCHEMICAL AND GEODYNAMIC FEATURES, RELATED MINERALIZATION

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The investigation of magmatism in the folded structures fraiming the Siberian craton in the south (Baikal region and Mongolia) revealed extensive occurrence of Phanerozoic granitoids. The granitoid magmatism is represented by batholiths of different age (Angara-Vitim, Daurian-Khentei etc.) individual granitoid massifs, and intrusive-dike belts with intrusion and subvolcanic rocks of diverse compositional characteristics. The rare-metal mineralization is often related to these granitoid series.

Rare metal granites and the dike series of the Khamar-Daban Range (Baikal area) are located within the Selenga-Vitim structural zone, the larger part of the zone is occupied by the Late Paleozoic Angara-Vitim batholith. Intrusions (Kharagul, Urugudei and Bitu-Dzhida) of rare-metal Li-F granites (Rb-Sr age is dated as 311-321 Ma) and intrusive-dike belt, including rocks from monzonitoids, subalkaline granite-porphyries (elvans), ongonites and topazites are recognized within this region. The early phases of the multistage intrusions (Kharagul, Urugudei) are made up fluorite-bearing biotite granites which demonstrate higher Zr, Th and LREE, that is typical of the rocks of the heightened alkalinity. As opposed to them topaz- and cryolite-bearing granites to the late stage and ongonites are marked by higher F, Li, Rb, Cs, Ta, Sn, W contents. There is an increase in fluorine concentration (to 2.5-3.0 wt. %) in the rocks series from biotite granites and elvans to amazonite-albite granites and ongonites. Geochemical evolution includes a decrease in the contens of Ba, Sr, Zn, Zr, Th, and U in the same direction. The accumulation of rare metal in magmatic evolution is responsible for genetic relation between these Late Carboniferous intraplate magmatism and Sn, Ta, Li, and W mineralization.

The granitoid rocks of the Daurian-Khentei batholith forms the central part of a huge Early Mesozoic magmatic area in Transbaikalia and Mongolia. The age of granitoids of the Abdar-Khoshutula intrusive-dike series varies from granites of the Khoshutula massif (224 Ma) to the rare-metal granites of the Abdar intrusion (209-212 Ma). The palingenic granites most likely formed at an early stage from the ancient substratum that was accompanied by a simultaneous intrusion of high-alkaline syenites. At the late magmatic stage nearly W-E trending intrusive-dyke belt was manifested by rare-metal granite intrusions and subvolcanic dikes of granite porphyry and in cases ongonites. The varieties recognized in the Abdar massif (from early leucogranites to amazonite-albite rare-metal granites) have the facies transitions without cross-cutting relationship, that can point out a possible genesis of all rocks of the intrusion during the magmatic differentiation inside the magma chamber. Two trends of the geochemical evolution were found for the studied series which correspond to two stages of its formation. Subvolcanic dikes of the belt and Abdar massif of rare-metal granites enriched with many lithophile elements originated at the late stage of the geochemical evolution. The granitic magmatism of the final stage is potential with respect to rare-metal mineralization.

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THE ORIGIN OF KIMBERLITES (FROM CHEMICAL AND ISOTOPE-GEOCHEMICAL DATA)

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Using the ICP-MS method we have studied the isotope systematics of Sr and Nd as well as trace element composition of a representative collection of kimberlites and related rocks from the Siberian Platform [1]. The summarized literature and our own data suggest that the kimberlites developed within the platform can be divided into several petrochemical and geochemical types, whose origin is related to different mantle sources. The petrochemical classification of kimberlites is based on persistent differences of their composition in mg# and in contents of indicator oxides such as FeOtot, TiO_2, and K_2O. The recognized geochemical types of kimberlites differ from one another in the level of concentration of incompatible elements as well as in their ratios.

Most of isotope characteristics of kimberlites and related rocks of the Siberian Platform correspond to the earlier studied Type 1 basaltoid kimberlites from different provinces of the world: Points of isotopic compositions are in the field of primitive and weakly depleted mantle. An exception is one sample of the rocks from veins of the Ingashi field (Sayan area), which is characterized by the Sr and Nd isotopic composition corresponding to Type 2 micaceous kimberlites (orangeites).

There are two trends on the plot $(^{87}Sr/^{86}Sr)_i/\varepsilon Nd$. The 1-st trend – to side of increasing of $(^{87}Sr/^{86}Sr)_I$ values from 0.704 to 0.710; it is explained by influence of secondary hydrothermal-metasomatic processes. The 2-nd trend – to side of decreasing εNd values from +4 to -2. It is typical for kimberlites from Anabar field and, possibly, reflects an influence of metasomatically altered lithosphere mantle.

The most important feature of distribution of isotopic and trace-element compositions (incompatible elements) is their independence of the chemical rock composition. It is shown that the kimberlite formation is connected with, at least, two independent sources, fluid and melt, responsible for the trace-element and chemical compositions of the rock. It is supposed that, when rising through the heterogeneous lithosphere of the mantle, a powerful flow of an asthenosphere-derived fluid provoked the formation of local kimberlite chambers there. Thus, the partial melting of the lithosphere mantle led to the formation of contrasting petrochemical types of kimberlites, while the geochemical specialization of kimberlites is due to the mantle fluid of asthenosphere origin, which drastically dominated in the rare-metal balance of a hybrid magma of the chamber.

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ABOUT EFFICIENCY INCREASE OF PROSPECTING WORKS ON DIAMONDS

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In spite of comparatively long study of primary diamondiferousness of the World ancient platforms (Siberian, East-European, African et al.), a number of questions for each of them require additional investigations. Thus, for instance, the problems of primary sources on prospective territories of Irkutsk area and Krasnoyarsk krai, diamonds of “Abelyakh” type, reasons of different kimberlite fields’ productivity of Anabar and Vilyuy subprovinces, related with unified protolith may be referred to the number of such unsolved issues for the Siberian platform. Voluminous materials, pertinent to radiometric dating of diamondiferous and potentially diamondiferous magmatites, role of faults, avlakogenes, geophysical characteristics of different in prospectivity areas and kimberlite fields of main subprovinces, require serious reasoning. Complex additional analysis is required of long-standing conceptions about epochs of the Siberian platform kimberlites formation, of which only Middle Paleozoic and, with big proviso, Triassic epochs are recognized as practically significant. At this general decrease of productivity from the center of province to periphery is noted, which is explained by different reasons. At the same time, for instance, on African platform there are no industrially non-diamondiferous time intervals of kimberlite-formation, though their number corresponds to such ones on the Siberian platform. Basing on the analysis of general position of diamondiferous and non-diamondiferous kimberlites we considered the process of productive magmatites’ formation within the Siberian platform by time sections-stages of Palaeogaea and Neogaea, making it possible to see that individual parts of a diamondiferous region are found in these or those time intervals in different historic-mineragenetic provinces (HMP). Their spatial superposition reflects migration of kimberlite-formation in space and time with the detail which is allowed by modern level of our knowledge. By “historic-mineragenetic provinces” we mean the areas of continents and oceanic basins of the Earth with mass occurrence of ore and non-ore material accumulations, formed in the course of a certain historic-mineragenetic stage. In order to increase efficiency and completeness of the Siberian platform territory prospecting we recommend to enhance investigations within the following historic-mineragenetic provinces (HMP): Early-Late-Pre-Cambrian (*Aldan, Ust’-Lena and Near-Yenisey* HMP), Riphean (*Anabar-Olenek, Angaro-Tungusskaya and Aldan-Stanovaya* HMP), Early-Paleozoic (*Vilyuy and Anabar-Olenek* HMP), Early-Hercynian (*Vilyuy, Angaro-Olenek and Angaro-Tungusskaya* HMP), Late-Hercynian (*Anabar-Olenek and Angaro-Tungusskaya* HMP), Kimmerian (*Nizhnelenskaya and Aldan* HMP, lamproites and kimberlites of Northern Taimyr), Early-Alpine (*Nizhnelenskaya and Aldan* HMP) and Late-Alpine (*Nizhnelenskaya and Aldan* HMP), which can complement data about diamondiferousness of these periods, together with discovered primary high-diamondiferous deposits of Middle-Paleozoic age. The importance of this idea is confirmed by kimberlite belonging of the recently discovered high-diamondiferous Nakyn field of Middle-Markha region of a new for the Siberian platform Early-Paleozoic epoch of thick crust-formation and kimberlite magmatism. And today this region, with already discovered pipes Botuobinskaya, Nyurbinskaya and body Maiskoye – is the most perspective both for prospecting of new primary and placer deposits, and for their industrial development. This gives hope that within the province, so much similar by geological structure to African platform, with time diamondiferous bodies of other kimberlite-formation epochs will be discovered. Besides mentioned above perspective different in age historic-mineragenetic provinces, one should pay special attention to investigation of a number of prospective territories and sites, in particular, Lower-Carboniferous and Triassic deposits of the Siberian platform north-east, which may lead to discovery of primary sources, not traditional for platform ages.

ABOUT USE OF STANDARD KIMBERLITE PIPES MODELS

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Kimberlite pipes of all diamondiferous provinces of the World are characterized by large variety of sizes, morphology, values of hearth location depth, internal structure, specific features of infilling rocks, content and composition of deep-seated (primary) minerals, as well as of the main mass of kimberlites, degree and reprocessing character of the last ones by postmagmatic solutions and in hypergene conditions, by content, morphology and physical properties of diamonds and other features. Some of the listed features of kimberlites are stipulated by occurrence of endogenous factors, and part – of exogenous. In spite of the fact that each kimberlite body represents individual, practically not repeating in nature object, there is much in common between them, which allows creating a unified model of a diamondiferous pipe for each platform. Transition of the vertical diatreme channel into a delivery dyke, specific features of kimberlite bodies with traps, as well as contingency character of the bodies' system found reflection in the model of the Siberian platform diamondiferous pipe: main pipe – satellite–feeding and pre-pipe dykes. When constructing the model the body of kimberlites (bulging of the kimberlite dyke) has been considered, which was exposed in the section of Cambrian deposits near pipe Udachnaya by open pit, and a bedded body (original "sill"), discovered in the deposits hosting pipe International. Destroyed by erosion upper part of most pipes of Malo-Botuobinsky and Middle-Markhinsky regions (to 300 m) was reconstructed on a summarized model due to the data about poor-eroded pipes of Daldyn-Alakit and other northern regions. Terrigene-carbonate formations of Lower Paleozoic serve as hosting rocks to the explored depth of the pipes. In kimberlite diatremes of the Siberian platform one can distinguish (from down upward): root part – feeding channel in the form of a dyke body; б) volcanic (vertical) channel; в) bellmouth (cone-like expansion), crowned by ring bank in not eroded apparatus. Each of these parts of the pipes is composed by rocks having some definite material and structural-textural features, creating peculiar vertical zonality of primary diamond deposits. Kimberlite pipes on *East-European platform (EEP)* are characterized by many specific properties, distinguishing them from classic kimberlites of the Siberian and African platforms. The hosting rocks of these pipes – monotonic alternate poorly cemented mudstones, siltstones and sandstones. Majority of kimberlite EEP pipes have isometric, close to rounded shape (some are stretched in north-eastern direction), which is caused by loose character of medium, into which kimberlite magma intruded. On uppermost horizons of poorly eroded pipes within the crater thick layer of volcanogenic-sedimentary rocks of lacustrine type is developed. Rocks of the diatreme are represented by volcanic formations. Productive kimberlites of ADP belong to low-satellite type. Most of kimberlite pipes of the African platform are exposed to the day surface. The upper part of the bellmouth of pipes is often like a mushroom cap in shape, the edges of which transform into ring bank, formed by outbursts of endogenous material proper and rocks, broken through by the kimberlite column. Morphology of kimberlite bodies is diverse: kimberlite bodies and dykes are common, sills are also not rare. Broad complex of sedimentary and eruptive rocks, which affect the morphology of bodies, character of secondary alterations and chemical composition of rocks, serves as hosting rocks of African kimberlites. Most kimberlite pipes are high-satellite and their chemical composition serves as reference for this type of rocks. Carried out comparative study of kimberlites of various world platforms indicated availability of both general and distinctive features, however practically it is expedient to apply the compiled models only for a particular region. There are some general features at the level of groups of pipes, kimberlite fields, mineragenetic zones, subprovinces, allowing creating models of different rank for their effective employment during forecast-prospecting and project works on each definite platform and in their definite diamondiferous regions.

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Selected work:

Apatite-bearing province of USSR / Faizullin R.M., Glebashev S.G., Sadykov I.S. et al. //Sov. Geol., 1982, №11, p.61-63.

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THE PERSPEKTIVE CONTAINING OF APATITES IN THE GREENSTONE BELTS OF THE WORLD

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The greenstone belts in association with granite-gneiss complexes, which are the base of the Archean cratones, are spreaded on the territory of all the ancient continents [2].

Greenstone belts are one of the richest sources of the ore and non-ore minerals. The Au, Cu, Ni, Cr, Sb, Hg, Bi deposits are the mostly wide-spreaded. The metalloids are mostly represented by chrysotile-asbestos, magnesite, talc, barite. Granitoids and pegmatites, contained by greenstone belts, contain rare-metallic minerals, muscovite, quartz, corundum, feldspat e.c.

Apatite-bearing abilities of greenstone belts are poorly explored. Unvalued in scale ore-demonstrations are stated in structures of bimodal type [3].The Holbolock-Uragine demonstration with apatite-silicate and apatite-carbonate ores with content of P_2O_5 in amount of 1,2-20,5% (in average – 8%) is located in the northern part of the Saimagan trough (Aldan shield). In the bounds of the Carelian granite-greenstone area of the Baltian shield the apatite demonstrations are known [1] in bounds of the greenstone structures of the Sumozer-Kenozerian belt; the perspectives of their disclosure in metavolcanites of South-Vygoserian and Vedlozer-Segozerian belts are presented. The increased amounts of the apatite (P_2O_5 4-7%) are distinctive for changed effusive minerals (basalts, trachibasalts, trachiandesite-basalts) of the endocontactional parts of the structures. In the greenstone belts of the Anabarian shield (Ilian inflection) the metamorphogenic-metasomatical apatite demonstrations are located; apatite-bearing alkaline metasomatites are also stated in the Billiah inflection.

In the bounds of Kursk-Voronej crystal massive of the East-European platform the apatite mineralization is predicted in Michailov-Belgorodski, Storojevsk-Borisovski and Sudjan greenstone belts. Srednepridneprovskaja granite-greenstone area (Ukraine shield) includes potentially apatite-bearing Krivorojsk-Kremenchuckski, Bezavlukski, Sursko-Petrikovski and other greenstone belts.

The bimodal belts are often linked with intrusive massives with industrial apatite mineralization (Ukdusskoe, Kabahanyrskoe, Evgenjevskoe deposites of the Aldan shield.

The greenstone belts of the Pilbar(Varravun), Rodesian (Belingve,Taty,Mount-Darvin) and Caapvaal (Barberton, Amali e.c.) cratones can also be classified as belonging to the bimodal type, the possibility of disclosure of the metavolkanites with industrial deposites of the apatite ores in these areas also is not precluded.

The presented new materials about the apatite content of the greenstone belts of the bimodal type widen the list of potential sources of the phosphorus raw and describe the perspectives of disclosure of new industrial apatite deposite.

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DEPOSITINAL ENVIRONMENT, SEQUENCE STRATIGRAPHY AND GEOCHEMISTRY OF LOWER CRETACEOUS CARBONATES (FAHLIYAN FORMATION), S.W. IRAN

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The Fahliyan Formation is a carbonate sequence of Lower Cretaceous (Berriasian-Hauterivian) age, and was deposited in the Zagros sedimentary basin. The Fahliyan Formation in outcropping type section and in a subsurface section in the Gachsaran Oil Field has been studied. In the type section, the Fahliyan Formation disconformably overlies carbonates of the Surmeh Formation, but in the Gachsaran Oil Field it disconformably overlies anhydrite of the Hith Formation. In both sections, the Fahliyan Formation is conformably overlain by shale and marl of the Gadvan Formation.

Facies analysis and petrographic studies led to the recognition of 10 microfacies that were deposited in homoclinal carbonate ramp with 4 facies belts i.e: tidal flat, lagoon, shoal and open marine.

The most important diagenetic processes affected on the carbonate rocks of the Fahliyan Formation are micritization, cementation, bioturbation, compaction, neomorphism, dolomitization, dissolution, fracturing and silicification. These processes operated in three diagenetic environments including marine, meteoric and burial.

The geochemical studies of carbonates (major and minor elements and carbon and oxygen stable isotopes) indicate that aragonite was original carbonate mineralogy. Fahliyan limestones have undergone a meteoric diagenesis in a closed diagenetic system. Paleotemperature calculation, based on heaviest $\delta^{18}O$ value in micritic samples of the Fahliyan Formation, shows that ambient water temperature was around 24° C during deposition of this formation.

Variation in relative sea level led to deposition of three third order sequences with sequence boundary type 1 and 2 in the Fahliyan Formation. Based on facies analysis, retrogradational and progradational stacking patterns of these depositional sequences have been recognized. The lower boundary in first depositional sequence in both sections are type 1 and the other boundaries are type 2. Maximum Flooding Surface in the Fahliyan Formation are conformable with main Maximum Flooding Surface in a same age in Arabian platform. Differences between thicknesses and type of facies in same system tracts of the two depositional sequences might be due to basement fault effect on sea floor sedimentary basin and accommodation space.

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Sphere of interests: Tectonics, Microtectonics, Geodynamics, Structural Geology, Tectonophysics, Ore formation processes

RECONSTRUCTION OF FLUID MIGRATION EVENTS AT THE ANTEI URANIUM DEPOSIT: GEOSTRUCTURAL EVALUATIVE APPROACH

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Migration of the dissolved substances or colloidal particles in a fluid flows under the influence of gravitation, stress and temperature is carried out by faults and cracks, from which substances and particles get into surround volume of rocks. Paleofluid pathways can be observed not only at macro- but also at microscale by studying microcracks of various generations and types.

Cracks in rocks can be considered as Open Cracks (O.C.: not filled with secondary mineral phases) or Filled Cracks (F.C: filled with secondary mineral phases or Fluid Inclusions). F.C. are often partially filled or reopened after a first time of filling. The best records of fluid percolation are paleofluids trapped as fluid inclusions in healed microcracks of the rock-forming minerals. Usually such fluid inclusions with liquid, vapor and solid phases form differently oriented systems, known as fluid inclusion planes, FIPs [1]. FIPs result from the healing of former open cracks and appear to be fossilized fluid pathways [2]. FIPs are totally sealed and do not present secondary opening. Orientation of FIPs is defined by reorganization of the local stress field, so it is possible to use them as geostructural markers for reconstruction of porosity and paleopermeability of rocks, geometry of fluids migration pathways, reconstruction of fluid migration stages and for studying dynamics of change of thermobarical, physical and chemical conditions at various events of deformation of geological objects.

Fluid migration stages were studied at the Antei uranium deposit. It is located in Eastern Transbaikalia within the Streltsovskaya caldera, generated in process of late-Mesozoic tectonic and magmatic activation of the region. Samples were taken from all fault zones – from the central part (core), the zone of its dynamic effect (failure), and undestroyed wall rock (protolith). Also for microfissural mapping of natural cracks and allocation of FIP systems, samples must be oriented in space, north direction must be fixed. The chronology of FIP generations and their spatial parameters (extension, dip angle) can be established by means of the classical microstructural analysis (Fedorov's stage), or by method of statistical analysis of 2D and 3D digital images of thin sections by means of the special software [1]. So for each FIP system, one can determine dip direction, length, thickness, porosity and paleopermeability and the data on composition and properties of fluid inclusions [2] trapped in the cracks (temperature, pressure, salinity, phase content) using microthermometry and Raman spectroscopy. After getting parameters of each FIP generation and making their interpretation the conclusion can be drawn: 1) Ore forming process at the Antei uranium deposit took place through several stages (min 2) of fluid migration; 2) FIPs change their orientation from the north-northeast to the east-northeast on a vertical interval from 9th to 11th horizon, this fact confirms that at this interval reorientation (about 30 degrees) of the horizontal paleostress axis take place; 3) This approach helps us to model paleopermeability of crystalline massifs (tectonics, fluid flow pathways, fluid chemical composition, etc.) as a function of stressed-strained and temperature state in space-time context.

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Area of my scientific interests: remote studying of ore regions, tectonic reconstructions.

ANALYSIS OF STRUCTURAL FRACTURING PATTERNS FOR AIMS OF FORECAST METALLOGENY (DALNEGORSK ORE DISTRICT, PRIMORSKY KRAY)

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Forecast model of ore-bearing territory may be developed after comparison of structural parameters' paragenesis and conditions of ore objects location. Dalnegorsk ore district was selected as the sample for model development, because it is studied in details and has a lot of ore objects of hydrothermal genesis. This district is located in the central part of Taukhin metallogenic zone. The types of mineralization are: skarn, vein, vein-impregnated and porphyritic. Also, mineral deposits of boron, tin, silver and gold are occurred.

Hydrothermal system corresponds to geologic dissipative structure, and as a result, has typical structural terms of organization, that may be quantitatively described [1]. Analysis of its infrastructure consists of recognition of the linear space image's elements with its further classification by the aggregate of structural parameters (also called "structural pattern"). In order to recognize leading ore-controlling structural parameters from their mass, multiple regression model was built. Major constituents were selected in accordance with the Kaiser criterion and the scree test.

For patterns' classification artificial neural network was used. The quantity of input neuron of multilayer perceptron corresponds to quantity of leading parameters. As a way of teaching, the method of Resilient propagation (RProp) was used. This method means "offline" teaching of the neuron with the weight correction after the presentation of all samples [2].

Elementary cell of the areal cover, were divided into the two types: "indeterminately prospective" and "prospective". Considerable coincidence of "prospective" cells' areas with the known ore-controlling structures and mineral deposits were discovered. The axial lines of defined "prospective" zones correspond to the basic regional faults position and orientation (northwestern and northeastern).

Discovering of the relations between structural patterns and hydrothermal ore-bearing can make study and classification of the only structural parameters sufficient for preliminary conclusions of the ore prospectivity. This classification presents economically valuable method of the territorial express-analysis for increase of resource potential in strategic kinds of mineral ores (noble, tin and multimetallic).

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Department of Quantum Science and Systems Engineering,
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・April 1994- March 1999
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Department of Energy and Mechanical Engineering
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Thesis Title: Construction of active sight system

EMPLOLOYMENT HISTORY

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JEDI (JAXA's Engineering Digital Innovation) Center,
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(Research) To develop the high-precision attitude control of flexible parabola antennas in satellites, we study the contact and friction mechanism with respect to joints of parabola antennas.

・October 2008 – March 2011
Advanced Power Electronics Project, Kanagawa Academy of Science and Technology, Researcher
(Research) The evaluation method of the power module reliability was developed through both the experimental and simulation technology.

・October 2006 – September 2008
Intelligent Modeling Laboratory, The University of Tokyo, Postdoctal Researchers
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・April 2001 – September 2003
Mechanical Engineering Research Laboratory, Hitachi, Ltd., Researcher
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BOOK

・Kazunori Shinohara, Hiroshi Okuda, Time Dependent Shape Optimization Using Adjoint Variable Method for Reducing Drag, Atmospheric Turbulence, Meteorological Modeling and Aerodynamics, Nova Science Publishers, (2010), pp.343-428

JOURNAL PUBLICATIONS

・Kazunori Shinohara, Qiang Yu, Fatigue life evaluation accuracy of power devices using finite element method, International Journal of Fatigue, 33(2011), pp.1221-1234.

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A FATIGUE-LIFE EVALUATION TECHNIQUE FOR POWER SEMICONDUCTOR DEVICES

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A computing-model-based fatigue evaluation technique for power semiconductor devices is being developed since 2000. In a previous study [1], the tension and compression were alternately applied to the wire-bonding area in a stress cycle test. Owing to the different crack mechanisms behind the stress strain in the stress cycle test and the thermal strain loaded on a real machine, the fatigue life cycle in the study [1] cannot be accurately evaluated. In 2004 [2], the thermal damage caused by the electric energy loss was verified by performing a electrical-thermal coupled analysis to calculate the temperature distribution of the solder layer. In 2008 [3], using a thermal cycle consisting of a low-temperature and a high-temperature point, the fatigue life cycle was evaluated through the thermal-mechanical coupled analysis. Owing to the thermal cycle, the temperature distribution in a power device tends to become uniform. However, in a real machine, temperature distributions become nonuniform.

In this study, a fatigue evaluation method based on an electrical-thermal-mechanical couple analysis is presented using the power cycle [4][5]. To control the electricity, a real active machine use this power cycle with two states, namely, electricity ON and OFF. Using the computing model shown in Fig.1, the fatigue life cycle is evaluated. The relation between the power cycle and the crack length is shown in Fig.2. These cracks occur in the solder (lead-free solder alloy). The maximum temperature is observed under the wire bonding area in the power device. Since the electrical conductivity of silicon depends on the voltage, the conductivity is an uncertain parameter. The calculation method for voltage and the electric conductivity is not included in commercial software such as ABAQUS. By changing the electric conductivity, the maximum temperature in the computing model can be adjusted. As the temperature of the power device increases, crack growth occurs at a rapid rate. The four points indicated in Fig. 2 show the

crack lengths for different power cycles (8000 and 11000). We try to apply the same maximum temperature conditions for four test specimens. However, the maximum temperature varies between 116.4°C and 122.8°C. In Fig. 2, the red line and the blue line correspond to calculation conditions with maximum temperatures 122.8°C and 116.4°C, respectively. Fig. 3 shows the crack length observed by an optical microscope. The crack occurs in the solder layer between the silicon layer and the conducting plate. Measurement points are shown between the red line and the blue line. The calculation results are agreed qualitatively with the measurement results. The proposed computing model can be used for qualitatively calculating the fatigue life cycle through the crack.

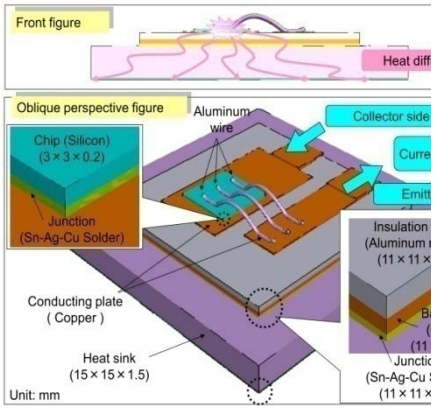

Fig. 1 Computing model of the power semiconductor device.

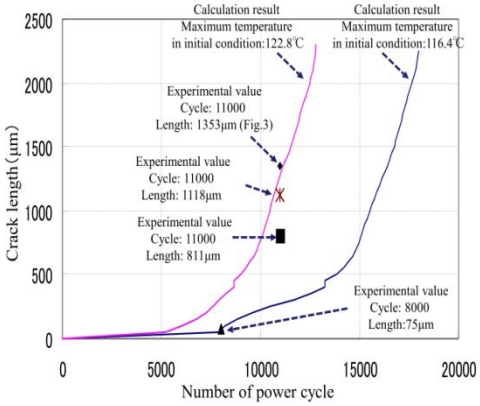

Fig. 2 Crack lengths for different power cycles

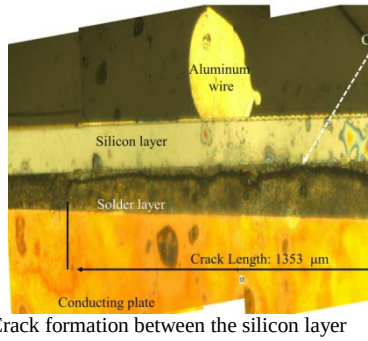

Fig. 3 Crack formation between the silicon layer and the conducting plate. (◆: the experimental value in Fig. 2, crack length: 1353 μm observed under an optical microscope, number of power cycles: 11000)

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APPLICATIONS OF ARTIFICIAL NEURAL NETWORK FOR THE ASSESSMENT OF BLAST-INDUCED GROUND VIBRATION

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There is an increasing trend towards surface excavation for exploitation of minerals and for infra-structural developmental projects in India. Drilling and blasting is one of the major economical operations to excavate a rock mass. Till now, explosives are a valuable source of energy required for breakage, excavation and displacement of rock mass. When an explosive detonates in a blast hole, a tremendous amount of energy, in terms of pressure (upto 50 GPa) and temperature (upto 50000 K), is released. Only a fraction of this explosive energy (20 to 30%) is used in the actual breakage and displacement of the rock mass and the rest of the energy is spent in undesirable effects like ground vibrations, fly rocks, noises, back breaks, over breaks, etc.

The ground vibration is a wave motion, spreading outward from the blast like ripples spreading outwards due to impact of a stone dropped into a pond of water. As the vibration passes through the surface structures, it induces vibrations in those structures also. High ground vibrations, not only do they create problems to the nearby population, but also adversely affects the integrity of the surrounding structures in the mine area vis-à-vis damages and chocks the existing ground water conduits and harms the ecology of the nearby area.

A number of vibration predictors were proposed by different researchers for the prediction of blast vibration. All the vibration predictors estimate the blast vibration based on mainly two parameters (maximum charge used per delay and distance between blast face to monitoring point). However, few predictors considered attenuation/damping factor too. For the same excavation site, different predictors give different values of safe PPV vis-à-vis charge per delay. There is no uniformity in the predicted result by different predictors. It is well known that the PPV is influenced by various geological, geotechnical, blast geometry and explosive parameters, which have not been incorporated in any of the available predictors. It is pertinent to develop a code, which can incorporate maximum number of influencing parameters for the prediction of blast vibration accurately.

Because the number of influencing parameters is too high and the inter-relation among them is also very complicated, empirical methods may not be fully suitable for such problems. Currently, tools such as artificial neural network, maximum likelihood classification, genetic algorithm, technique for order preference similarity to ideal solutions, support vector machine etc are frequently applied.

The artificial neural network (ANN) is a branch of the artificial intelligence science and has developed rapidly since the 1980s. Nowadays, ANN is popularly used and considered one of the intelligent tools to solve complex problems. ANN has the ability to learn from patterns acquainted before. It is a highly interconnected network of a large number of processing elements called neurons in an architecture inspired by the brain. ANN can be massively parallel and hence said to exhibit parallel distributed processing. So, in this paper an attempt has been made to predict the blast vibration of largest opencast coal mine of India by incorporating blast design, geotechnical and explosive parameters using three layered artificial neural network model as well as compare the predicted blast vibration results with various vibration predictors.

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Monographs

Obzhirov.A.I. Gas geochemical fields in bottom water of seas and oceans. – Moscow: Nauka. 1993. – 139 p.

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Patents

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REGULARITY TO FORM GAS HYDRATE AND OIL-GAS DEPOSIT AND GAS GEOCHEMICAL METHOD TO SEARCH IT

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Many international expeditions were provided in Sakhalin shelf and slope of the Okhotsk Sea to search flux of methane and gas hydrate [1-2]. It carried out in frame international projects – KOMEX (Russian-Germany, 1998-2004), HAOS (Russian-Japan-Korea, 2003, 2005-2006), SAKHALIN (Russian-Japan-Korea, 2007-2012). About 500 fluxes of methane bubbles from sediment to water and some of it in atmosphere were fixed in the North-East Sakhalin shelf and slope of the Okhotsk Sea during our investigation of it from 1988 to 2011.

It is very important to understand regularity forming and dissociation gas hydrate. The next geological, geophysics and hydro-acoustics characteristics assist which help to explain to form methane bubbles fluxes and gas hydrate in the Okhotsk Sea. The first is methane fluxes are mostly located in the zones fault. Methane is going from deep layers to up in surface sediment and water column via zone fault. Source of methane is oil-gas bearing layers. It accompanies thickness sediment with it in North-East Sakhalin slope is about 5-7 km and many hydrocarbon deposits were discovered in Eastern Sakhalin shelf in structures with sediment consist oil-gas-bearing layers that stretch in the slope. But carbon isotopic ratio of methane of gas hydrate is $\delta^{13}C$ of C1 = -55 - -65‰. It is show that sources of methane are mixture - thermogenic and microbial. We think that microbial methane form mostly due to convert thermogenic methane of oil-gas deposit near surface area. These regularities we use to search gas hydrate, oil-gas deposit and appreciate seismic activity [3-4].

When methane bubbles come up from oil-gas deeper layers to the seafloor gas hydrate is form in near surface layers sediment in gas hydrate stability zone. Below this zone in bottom gas hydrate thickness, (BSR) free gas accumulates. If zone fault activities pass way increase and free gas (mostly methane) come up in surface sediment and water. Methane reaching the seafloor and in cool temperature in it condition a second (new) gas hydrate layers form near seafloor sediment usually with cm-scaled layer or fragments in the water depth deeper 400 m. A remarkable sample was massive hydrate layer with about 35 cm thickness. Gas hydrate supports to form oil-gas deposit because it preserve hydrocarbon and good keep it like cap.

So, in the North-East Sakhalin shelf and slope of the Okhotsk Sea have been found about 500 methane flux and 14 gas hydrate areas. Quantities of methane flares and methane concentration in water column increased since 1988 that are connected with seismic-tectonic activation Their activity leads to open zones fault and gas/fluid migration. In area with methane flux a new gas hydrate is forming near surface sediment. The methane fluxes from the sediment into the water column, gas hydrate and other regularities help us to understand interrelation between methane fluxes, gas hydrate and oil-gas deposits and to search it.

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4. A.Obzhirov, V.Yusupov, A.Salomatin. Patent. Gas-Hydroacoustic complex to estimate seismic-tectonic activity. RU № 78333 U1, 2008. Bull. No 32.

I am **Dr.D.Jayaperumal**, working as **Senior Principal Scientist** in Corrosion Testing and Evaluation Division at Central Electrochemical Research Institute, Karaikudi 6. I am basically **Chemical Engineer**. I did my **graduation** and **post graduation** in **Chemical Engineering** at **Annamalai University**, Annamalai Nagar. I have been awarded **Ph.D.,** degree in **Corrosion Science and Engineering** by Industrial Chemistry Dept. **Alagappa University**, Karaikudi 3. The title of the thesis is, **"Studies on Corrosion Inhibitors for Metal in Acid."** The work is mainly focused on the "**Application of the oil and gas wells acidization process".**

I have developed many technologies related to **corrosion prevention and control** in the field of **oil and gas well acidization, pickling paste for the weldment of stainless steel, cleaning solution for bailers, heat exchangers and pipelines.** The developed green technologies have been filed as the **Indian patents.** I have published **26 research papers** in peer reviewed International **SCI JOURNALS** with high impact factor and **20 papers** in National and International conferences, symposia and seminars.

I am an expert in carrying out all the **electrochemical and non-electrochemical techniques** regarding corrosion **testing, monitoring and evaluation of metals**. I have completed many **sponsored** and **consultancy** projects as a principal investigator as well as member of the team works. Now, I am a team member of an **International Sponsored Project** funded by **Yonsei University, South Korea,** over a period of 5 years with the amount of **1,00,000 USD** which is on going one.

I have guided more than **45 B.E., B.Tech., M.E., M.Tech., M.Sc.,** and **M.Phil** students from different colleges. I was a member in editorial committee for current titles. Presently, I am a **board member of Annamalai University**. Besides all, I am a reviewer of **materials chemistry and physics, corrosion science and journal of applied chemistry.**

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MITIGATING THE DETERIORATION OF STEEL TUBE IN HYDROCHLORIC ACID SOLUTION USING SOME ALDEHYDE COMPOUNDS DURING ACIDIZATION PROCESS

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Acidization is a process used in oil and gas production to stimulate or increase the oil and gas flow out of the hole and to descale encrustations in the production well. Hydrochloric acid (10 – 15 mass %) is used for fracture operations if the formation is mainly calcareous or Mg containing. To reduce the corrosion of the well equipment during acid treatment, the acid must be inhibited. In this present work, the inhibition efficiencies of Formaldehyde (FOAL) and Cinnamaldehyde (CIAL) on the corrosion of mild steel in 15% commercial hydrochloric acid have been evaluated by mass loss method, electrochemical techniques and surface analysis techniques with 0-1% inhibitor concentrations at 30^{o}C and 105^{o}C. Both FOAL and CIAL are excellent inhibitors for the above-mentioned system. FOAL gives 96% and 91% inhibition efficiencies at 30^{o}C and 105^{o}C respectively for 1% inhibitor concentration where as CIAL gives 99% and 95% efficiencies at 30^{o}C and 105^{o}C respectively for 0.6% inhibitor concentration. Polarization studies confirm that FOAL and CIAL are mixed type inhibitors. FOAL and CIAL obey Tem kin's adsorption isotherm at both the temperatures. UV reflectance, FT-IR and SEM studies confirm that the surface of mild steel is not affected in the acid containing FOAL and CIAL.

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APPLICATION OF MAGNETITE NANOPARTICLES FOR METALLIC CATIONS REMOVAL FROM WATER

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Nanopowder sorbents are promising materials for water purification techniques because of the high specific surface area to volume ratio. In particular, a good sorption of heavy metals (Cr, Cu, etc) in water solution by magnetite nanopowders was demonstrated [1]. However, a very small particle size makes the process of the sorbent separation from the solution by conventional methods (precipitation, filtration, etc.) rather difficult. This problem can be solved by injecting magnetic nanoparticles (metal iron and iron oxides) followed by a removal of the powder from water solution in a gradient magnetic field.

The sedimentation of magnetite (Fe_3O_4) nanoparticles in water was investigated, both in the gravitational field only and in the presence of a vertical gradient magnetic field. The nanoparticles (10-80 nm) were prepared by a gas-synthesis method The sedimentation was monitored by measuring the light transmission coefficient k of the water suspension as a function of time. The sedimentation process is of rather complex character for both the large and the small particles. Specifically, the transmission reflects the different stages of the particle aggregation. Magnetite nanoparticles tend to aggregate into microne-sized aggregates which sediment rather rapidly in high concentrated suspensions (for example 5 g/l), even in the absence of a magnetic field. Gradient magnetic fields (H= 3-6 kOe, dH/dz =1- 2 kOe/cm) help to increase the sedimentation rate tremendously and reduce the total sedimentation time from several days up to several minutes.

An effective removal of heavy metal pollutants from water solution can be achieved using the optimal combination of particle size, distribution and magnetic field gradient [2].

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M.Sc.	1974	First	Zoology	Aligarh Muslim University
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Research interest : Nanomaterials (Toxicology/Nanodevice)

Research Publications :65 in peer reviewed national and international journals

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Examiner/Guide: Recognized examiners of M.Sc /Ph.D. /M.D. of several universities including medical university.

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Bharat Jyoti Award
Best Citizens of India Award
Ittehad Foundation of India Award
International Gold Star Award
Served as member ILO convention 62 on Asbestos
Chaired 13 Scientific sessions in International and national conferences

MONITORING AND IDENTIFICATION OF AIRBORNE ASBESTOS IN UNORGANIZED SECTORS IN INDIA

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Rajasthan state in India is credited to cater more than 90% of total production of asbestos in this country, of which around 60% is processed there in unorganized sectors including milling and manufacturing of asbestos-based products. Unorganized asbestos units particularly mills showed unhealthy occupational conditions, therefore industrial hygiene study was carried out focusing on the prevalence of asbestos fibres in air at work zone area of asbestos milling units. Fibre levels were in the range of 2.00-5.09f/cc and 4.07-15.60f/cc in unorganized asbestos mills of Rajasthan located at Beawer and Deogarh districts, respectively. Like asbestos concentration, fibre type and length are also vital factors in the health risk assessment of industrial workers. Phase contrast and polarized light microscopic study of asbestos fibres showed their amphibole nature registering about 90% as tremolite and rest as anthophyllite. Fibre length measured micrometrically were sub-grouped in <10 µm and ≥10 µm. About 30-40% fibres belonged to sub-group <10 µm. It is concluded that unorganized asbestos mills bear poor industrial unhygienic conditions reflected specifically from their many fold higher fibre concentrations than the Indian and International standards. Poor industrial unhygienic conditions are attributable to obsolete milling technology, lack of pollution control devices and escape from regulatory control.

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- 21 Years of R&D experience in the fields of Ecology and Environment**:** Diploma in Patent Management–2005**, INFODOC,** New Delhi
- **Expert member** in the World Bank aided project EMCBTAP
- **Teaching:** 3yrs experience of Indira Gandhi Open University, New Delhi, India.

Credentials in Projects, Scientific Publications & IPR:

- *2 Research papers in world prestigious journal NATURE(London).*
- Completed successfully more than 50 major Projects; ***4 ongoing projects afoot***.
- More than 120 international and national technical research papers
- Edited 10 Proceedings.
- Guided 3 Ph.D. and 50 M.Sc. and M. Tech students
- 3 Patents and one copyright

Honors/Awards: 28: The selected honors are:

- Fellow – International Society for Tropical Ecology (1995);
- Editor - Wild Fire, IAWF, Washington, USA (1995)
- Biodata cited in Dictionary of IBC, Cambridge, England (1997).
- CSIR, CMRI Whitaker Golden Jubilee Award**, (**1998);
- Best technical Rajbhasha Prize- 8 Times
- Governing Board of Editors ABI, USA**,** (1996) **Editorial Advisory Board -Member**, of several journals.

Organizing/Editorial Committee Member: More than 30 R&D related events

REVEGETATION IMPROVES SOIL FERTILITY AND DUMP STABILITY OF COAL MINE SPOIL IN INDIAN DRY TROPICAL ENVIRONMENT:

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Our society and civilization now rely heavily on the mining industry to operate and maintain comfort, for which there is needs huge amount of coal for massive energy generation. In India, the estimated resource of coal reserve are about 64,786 MT out of this reserve, approximately 52,546 MT is considered geologically proved reserve, whereas 30,356 MT of coal reserve is possible to extract with present knowledge and technology. The total coal production from coal India limited is to about 431 MT for the year 10-11 and estimated dump will be more than 2 to 3 times of coal.

Generation of huge quantity of overburden dump through mining causes extensive landscape destruction. The dump material needs proper place for safe disposal. It is also difficult to get land around the mine due to either restriction by environmental act, forest land or agricultural land. The steeper dump slope is always preferred because it occupies less surface area but it is often vulnerable to failure, which leads to hamper the regular coal production, loss of life, equipment and surrounding eco-system. Further, it also reduces ecological succession, soil microbial activity and soil fertility. Therefore, a study was performed to evaluate the soil fertility and mine dump slop stability after revegetation of dry tropical ecosystems of India

Plant available nitrogen, belowground (root) biomass, soil nitrogen (N) mineralization and microbial biomass N (MBN) were studied for twelve years at the interval of two years (0, 2, 4, 6, 8, 10 and 12 yrs) and mine dump stability at the intervals of six years (0, 6 and 12 yrs) after re-vegetation on coal mine spoil site. Plant available nitrogen in revegetated mine spoil ranged from 8.0-11.86 Kg ha^{-1}, net N-mineralization from 3.37-24.93 Kg $ha^{-1}mo^{-1}$, MBN from 18-40.73 Kg ha^{-1}, and root biomass from 280-5660 kg ha^{-1}. Mining caused loss of physico-chemical characteristics of soil including plant available nutrients like nitrate-N, ammonium-N and phosphate-P by 70, 67, and 76%, respectively, N-mineralization by 93%, root biomass values by 97% and MBN values by 91% compared to forest ecosystems. Revegetation of mine spoil produced increase in root biomass values by 1.3, 7.6 and 17.2 times, mineral N values by 1.22, 1.43 and 1.79 times, N-mineralization values by 1.8, 5.2 and 12.6 times and MBN values by 1.6, 2.0, and 3.4 times in 2, 6 and 12 yrs, respectively. Below ground biomass was highly co-related with microbial biomass and plant available nutrients. Clay content was positively correlated to N-mineralization, plant available nutrients and the age of revegetation ($P<0.01$). From the numerical modelling it was analyzed that revegetation increased the dump slope stability with a factor of safety of 1.7 and 2.1 after 6 and 12 yrs of plantation on dump slope, respectively, while it was 1.2 before revegetation. Thus, long term revegetation was found to have direct impact on dump stability and indirect impact on soil fertility status in mine spoil, where plant biomass and microbial biomass provide major contributions in ecological redevelopment of the mine spoil.

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EXPERIENCE

Scientist, 2010- present

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RESEARCH INTERESTS

Geoecology, ecological chemistry, geochemistry

CHEMICAL COMPOSITION FEATURES OF SOILS AROUND TAILING POND OF MIZURSKY PROCESSING PLANT (NORTH CAUCASUS, RUSSIA)

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The chemical compound of soils can change considerably under the influence of the anthropogenous factors especially connected with mineral reprocessing. This investigation reports preliminary laboratory results, which represents major and trace element concentrations in soils around Unalsky tailing pond.

The Mizursky processing plant located in the Republic of North Ossetia–Alania (North Caucasus, Russia). Landscapes of this territory concern ecologically most vulnerable systems. Mining for lead and zinc began here from the end of 19 century. Factory raw-material base presented by vein-rocks of the Sadonsky ore deposit. The basic minerals extracting and processing from ores are galenite and sphalerite.

One of sources of pollution by heavy metals of soils is a waste of Mizursky processing plant, stored in tailing pond around the village Nizniy Unal. Pollutants pass in mobile forms and accumulate in various near-surface environments.

The mineral structure of tails is correlated with average structure of ores of polymetallic deposits of Sadonsky ore area. Ore minerals, in decreasing order, are presented by sphalerite, galenite, pyrite, marcasite, chalcopyrite and arcenopyrite; nonmetallic – quartz, chlorite, barite, siderite and calcite [1].Considerable part of an open surface (from 40 to 50 percent in a various season) is constantly covered by water. The strip of dry tails, width of 45-100 m, reaches the northeast along a dam which are bending around tailing pond from the east. Taking into account the occupied area (17,5 hectares) and the measured depth(12-15 m), the capacity of tailing pond exceeds 2,2 million square meters.

Soils were collected in September 2011 year. Samples were selected along the profile, located in four-hundred meters to the southeast perpendicularly to the tailing pond. Depth of samples selection was 10-20 sm below an earth surface, weight of each sample was about 2 kg. The analysis of a chemical compound (24 samples) was executed by Philips PW2400 X-ray Fluorescence Spectrometer (chemist Yakychev A.I.).

Concentration of twenty six major and trace elements are defined in the samples of soils. Concentration of lead varies from 234 to 8212 ppm, the average value is 1947 ppm; zinc - from 217 to 3906 ppm (an average 1763 ppm); copper – from 51 to 630 ppm (an average 206 ppm); arsenic – from 14 to 320 ppm (an average 114 ppm); chromium – from 50 to 160 ppm (an average 98 ppm); vanadium – from 39 to 140 ppm (an average 107 ppm); cobalt – from 4 to 29 ppm (an average 17,6 ppm); nickel – from 25 to 72 ppm (an average 51,9 ppm); rubidium–from 48 to 229 ppm (an average 171 ppm); strontium– from 55 to 159 ppm (an average 85 ppm);barium – from 221 to 822 ppm (an average 570 ppm);chlorine – from 115 to 274 ppm (an average 160 ppm); zirconium – from 78 to 461 ppm (an average 243 ppm)and others. Maximum allowable concentration is exceeded for lead in 60 times, zinc in 70 time, copper in 7 times, arsenic in 57 times.

Conclusions: the obtained data are evidence of danger of tailing pond for environment. Preliminary researches of a chemical compound of soils show considerable excess of maximum allowable concentration on 4 presented elements that confirm necessity of carrying out of the further researches in the field of migration of technogenic substances.

1. Panshin A.M., Evdokimov S.I., Solodenko A.B., Dzajnukov A.B. Recycling of a waste of the mountain-metallurgical enterprises. Vladikavkaz: Mavr, 2009. 196 p.

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2. **First names:** **Jozef**
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5. **Education**

Institution [Date from – Date to]	Degree(s) or Diploma(s) obtained:
1961-1967: Faculty of Nuclear Sciences and Physical Engineering, Czech Technical University, Prague, Czech Rep.	MSc.
1969-1972: PhD studies, dtto	PhD
1978: Theses on Dosimetry of Ionizing Radiation	Associate Professor
1990: Theses on Radiation Protection and Safety	DSc.

6. **Language skills: Indicate competence on a scale of 1 to 5 (1 – excellent; 5 – basic)**

Language	Reading	Speaking	Writing
English	1	1	1
Russian	1	1	2
German	2	3	4
French	4	5	5

7. **Membership of professional bodies:**

Society for Radiological Protection, UK
Fachverband für Strahlenschutz e.V., Germany and Switzerland
International Radiation Physics Society
Czech Radiation Protection Society, Czech Republic

8. **Other skills:**

Familiar with standard and many other application software packages for calculation in radiation protection and nuclear safety including the use of the Monte Carlo method

9. **Present position:**

Associate Professor and researcher at the Faculty of Biomedical Engineering, Czech Technical University in Prague (involved in radiation protection, radiological physics, safety and security of radiation sources, application of radiation and radionuclides in medicine and industry);

Senior Consultant, Project “Development of Autonomous GPS Based Radiation and Radioactivity Monitor for the Assessment of Radiological Emergency Situation” supported by the Czech Ministry of Industry and Trade;

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10. Professional Experience

Date from - Date to	Location	Company	Position	Description
1967-1998 (with some interruptions given below)	Prague, Czech Republic	Faculty of Nuclear Sciences and Physical Engineering of the Czech Technical University	Lecturer, Senior, Senior Lecturer, Associate Professor	Lecturing in radiation dosimetry, radiation protection, radiation monitoring, nuclear instrumentation; writing books and textbooks; participating in research projects aimed at radiation protection and safety
1974 (10 months)	Birmingham, UK	Department of Physics of the University of Birmingham	Research Fellow	Engaged in mixed gamma-neutron spectrometry and radiation/nuclear safety
1981-1986	Kuwait City, Kuwait	Radiation Protection Department of the Ministry of Health	Consultant Physicist, Head of Department	Regulatory control of radiation sources and practices and individual/environmental radioactivity monitoring
1992-1994	Hsinchu, Taiwan	Innstitute of Nuclear Sciences of the National Tsing Hua University	Visiting Professor	Involved in lecturing in radiation and nuclear safety; engaged in research in the field of radiation protection and radon monitoring
1998-2006	Vienna, Austria	Department of Technical Cooperation of the IAEA	Manager of the Model Project on radiation protection	Responsible for the implementation of the IAEA TC Model Project on the upgrading radiation protection infrastructure in selected more than 20 Member States
2006-2008	Centurion, South Africa	Pebble Bed Modular Reactor, Ltd.	Senior Consultant in Radiation and Nuclear Safety	Engaged in radiation and nuclear safety in the process of designing nuclear fuel plant and demonstration power plant based on the PBMR high-temperature reactors
2009 (6 months)	Vienna, Austria	Office of Nuclear Security, of the IAEA	Consultant in Radiation and Nuclear Security	Consultant in the safety and security of high-activity sealed radioactive sources, implementation of the HASS EU Directive
2009-2010	Prague, Czech Republic	Police Academy of the Czech Republic	Associate Professor	Lecturing on preparedness for radiological emergences and mitigation measures in case of radiation or nuclear accidents

2010 - now	Prague, Czech Republic	Faculty of Biomedical Engineering, Czech Technical University in Prague	Associate Professor and researcher	Lecturing and research in radiation protection and nuclear safety, application of radiation and nuclear technology in medicine and industry

11. Specific experience:

Head of the Department of Dosimetry and Application of Ionizing Radiation, Faculty of Nuclear Science and Physical Engineering of the Czech Technical University (CTU); Vice-Dean of the Faculty; Member of the Scientific Council of CTU; participated in the preparation of many documents on the control of exposure and sources; lectured in training courses organized by the State Office for Nucl. Safety, IAEA, and at some universities abroad; during the 8-year work at the IAEA occupied position of a Regional Manager of the radiation related projects, engaged in preparation of some documents addressing industrial applications of ionizing radiation and radioactive sources, and visited more than 150 facilities in more than 50 countries, incl. those involved in industrial applications; an expert of the IAEA undertaking about 15 expert assignments; Senior Consultant for the Pebble Bed Modular Reactor, Ltd. (PBMR), developed more than 10 documents on radiation and nucl. safety required for licensing procedures; a regulator during the stay in Kuwait (introd. of a system of authorization and inspection).

Evaluator of project applications under various research programmes supported by the Government of the Czech Republic and other organizations; reviewer of scientific papers submitted to journals such as Health Physics, Radiation Protection Dosimetry, Nuclear Safety etc.

Participated in more than 20 research projects (included 4 international) mostly as a pilot investigator.

Lecturer in national and international training courses (including national, regional and post-graduate courses organized by the IAEA) on radiation protection, nuclear safety, application of nuclear technology in industry and medicine, regulatory control of radiation sources and exposure, radiation and nuclear safety and security etc.

12. Other relevant information (including publications):

Chairman of the IRPA Regional Symposium in Prague in 1997;

Evaluator and reviewer of scientific projects and papers for the publications in scientific journals;

Supervisor of MSc and PhD students;

Lecturer in training courses for users in industry and medicine (IAEA training courses, course organized by the Czech State Office for Nuclear Safety);

Author or co-author of 11 books or textbooks on radiation protection, safety and security of radioactive sources, radiation monitoring, dosimetry, and environmental radioactivity measurement in Czech in other languages including Introduction to Radiation Protection Dosimetry (in English, published in Singapore), and Environmental Radioactivity Measurement (in English, published in USA).

Author or co-author of more than 200 other publications in scientific journal or papers presented at various international conferences.

Some of recent publications (in 2009/2011):

Sabol,J. et al.: *Weapons of Mass Destruction and Protection against their Effects*, Textbook, Police Academy of the Czech Republic, Prague, 2009;

Sabol, J. and Kohout, P.: *Industrial Radiography – The Important Role of Training in Radiat. Protection*, NDT Welding Bulletin, Special Issue, pp. 32-35, Praha, 2009;

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ASSESSMENT OF THE TOTAL EFFECTIVE DOSE OF MINERS IN THE UNDERGROUND ROŽNÁ URANIUM MINE DURING THE PERIOD OF 2004-2011 AND THE OVERVIEW OF URANIUM DEPISITS IN THE CZECH REPUBLIC

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The paper discusses the situation in the Czech Republic regarding past and present uranium mining with emphasis on the evaluation of the exposure of underground miners in the Rožná Uranium Mine, which is currently the only active mine in the country and practically in the entire European Union. The total effective dose has been summarized taking into account all three major components, namely radon short-lived decay products, long-lived alpha emitters in ore dust and penetrating external gamma radiation. The average and maximum values of the effective dose as well as the collective effective dose of underground miners are also presented.

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EFFECTS OF NON-AXENIC CASING SOIL ON MEDICINAL MUSHROOM GROWTH

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The aim of this study was to examine relationships between the physical properties of non-axenic casing soil and yield, number and weight of *Agaricus blazei* ss. Heinemann (*A. brasiliensis*). We collected five soil combinations from two depths to evaluate as casing layers. The experimental design was a factorial 5x2 design with eight replicates in each treatment. Each replication corresponded to a perforated plastic box filled with 12 kg of compost. We analyzed yield, number and weight of mushrooms and the physical properties of the soil using as casing layers. Neither soil depth nor the different soil combinations affected yield and number of mushrooms. However, the weight of mushrooms was influenced by soil combination and depth. Clay content, density and yield showed negative correlations. On the other hand, positive correlations were found between silt content, water-holding capacity of the soil and yield. Mushroom number was negatively correlated with water-holding capacity and positively correlated with clay content, density and porosity. Finally, mushroom weight was positively correlated with the amount of fine sand and negatively correlated with coarse sand, total sand and clay content.

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