

Regional Rock Geochemistry of the Leninogorsk and Zyryanovsk VMS Region (Rudny Altay, Kazakhstan) - Implications for Genesis and Exploration

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ABSTRACT

The Rudny Altay VMS province extends over 500 km along the north-eastern border of Kazakhstan (VMS deposits). The main resources are concentrated in the Leninogorsk and Zyryanovsk ore districts associated with volcanogenic-sedimentary rocks of the Devonian period. The total metal reserves (Zn + Pb + Cu) comprise approximately 23 million tonnes in the Leninogorsk district and 20 million tonnes in the Zyryanovsk district.

The deposits are now exhausted and there is an urgent need to locate new reserves. With this aim, the AO "Kazzinc" has commenced exploration work based on IONEX technology, which involves mapping geochemical systems of various scales and identifying both enrichment and depletion zones of ore and associated elements. The work is being conducted in several stages, the first of which has included a regional geochemical survey over an area of 24,000 km² on a scale of 1:500,000 (5 x 5 km).

The survey data have shown that deposits are localised in zones of enrichment of ore-forming elements (data are given for Zn and Pb). Depletion zones of these elements have been identified on the periphery of the enrichment zones. Overall, the zones of depletion and enrichment can be described as polar geochemical systems. The area of the Leninogorsk system constitutes 9000 km², and Zyryanovsk system – 8000 km². It can be assumed that the depth of such system will be not less than 20 km. Zones of Ti enrichment surround the external boundaries of the nuclei of these systems, with the central nucleus of the Leninogorsk system covering 3000 - 3500 km² and that of the Zyryanovsk system - 2400 km². The enrichment zones have been found to extend to a depth of 2 km.

The formation of such geochemical systems is associated with the huge-scale extraction of dispersed elements from rocks, varying in composition and age in their total volume. In the margin of these systems, depletion zones should be seen as areas of mobilisation of ore elements. In the case of the Leninogorsk district the total mass of redistributed zinc inside of this system comprise approximately 2 billion tonnes.

The first stage of the work has made it possible to identify the nuclei within the systems. The size of the depletion zones associated with the systems' nuclei has helped determine the potential and priority areas for the next stage of exploration. As a result of the first stage of work, the exploration region has been reduced by 80% and the most promising areas singled out.

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Degree in Mineralogy, Leningrad State University (Russia), 1953

PhD Geological Research Institute, Leningrad, 1964.

Senior Geologist, Tadjik Geological Department, Dushanbe, 1953-1961.

Scientist worker (1961-1980), Head of Geoelectrochemical Laboratory (1980-1991) at Research Institute NPO Rudgeofizika, Leningrad (Russia). Head of the Studio of Geochemical Works KODO Pty Ltd , Leningrad (1991-1994).

Chief Geochemist and Geoelectrochemist of IONEX Pty Ltd (1994 till now)

Dr I. Goldberg developed CHIM – a new geoelectrochemical method used to discover “blind” ore deposits.

Dr I. Goldberg and Prof Yu. Ryss discovered a new phenomena – Vertical migration of mobile metals from deep-seated ore deposits by means of geoelectrochemical methods CHIM, MPF, TMGM, MDE. These methods have been tested successfully in different regions of the USSR (Kazakhstan, Kola Peninsula, Siberia Far East, etc as well Canada, Australia.

Dr I. Goldberg , Dr G. Abramson and Prof V. Los developed new IONEX Technology for exploration on any scale (regional to local). IONEX Technology is based on theoretical and experimental data of elements mobilisation under natural electrical fields. IONEX Technology successfully used in overburden terrain and thick cover area. IONEX Technology successfully tested in USSR.

Dr Grigory Ya Abramson

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Degree in Exploration and Exploitation, Moscow Institute of Geological exploration (MGRI), 1967
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Dr G. Abramson has developed the Method of Zoning in Ore Deposits and successfully applied it on numerous prospects in Russia, Bulgaria, Middle Asia, Africa and trialled in Australia.