An introduction of electrogeochemical technique with a laboratory model for exploration of hidden base metal deposits

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Abstract: The electrogeochemical method is a new exploration technique with a foundation of electrochemistry. The method has ability to detect hidden ore deposits which have been covered with overburden placers and topsoil. Although this technique is unique and powerful, no attempt was made in our country to apply this new method practically so far. In this method an artificial DC electrical current has been injected into the topsoil over hidden ore deposit which causes ionization, ion concentration and migration towards an especially designed cathode. The anode is an steel electrode while the cathode is made from graphite which has been fixed in a semi-permeable container full of acid. Then the DC current will be injected into the cover soil. After some time (at least several hours), due to ionization of metallic orebodies and electrochemical processes, metallic ions will be migrated towards cathode and will be concentrated in acidic electrolyte. Using AAS or ICP analytical methods the metallic ions will be analyzed in the acid. Before applying the technique in the field, the ability of the method was evaluated with different ore and soil situation and conditions in the laboratory scale. According to our findings, the factors such as depth of mineralization, soil moisture, the amperage and voltage of injected current, injection time and acid concentration as electrolyte are the most important factors influencing the method. The optimum amperage and time injection have been identified as 500 mA and 8 hours, respectively.

Keywords: Electrogeochemistry; base metal exploration; hidden ore deposits; element migration; ionization.