THERMOPHYSICAL MODEL FOR A PORPHYRY Cu-Mo SYSTEM

A. G. Tvalchrelidze

Thermophysical model for a porphyry copper system was elaborated using the material on the Merisi Mining District in Georgia. The district is built up by a Tertiary volcanogenic calc-alkaline sequence intruded by a monzonite-granodiorite-granitic pluton. Two types of ores are present. Stocks of quartz diorite porphyries contain disseminated Cu-Mo mineralisation, whereas commercial reserves of Cu, Pb, Zn, Au and Ag are connected with vein deposits situated around the plutonic massif. Comparison of the Merisi mines with other plutonogenic mining districts of the world demonstrates that amount of deposits decrease reversibly proportional to metal reserves in them. Investigations have revealed a rhythmical type of interdependence between Pb/Zn reserve ratios in deposits and their distance from the central part of the plutonic outcrops. Thermodynamic model for such zoning indicates that rhythmical distribution of metal reserve ratios is due to kinetic character of ore deposition. Thermophysical modelling have shown that ore deposition took place after a certain time interval following intrusion of granites due to necessity of fluid cooling up to temperature when acids become able to dissociate. Ore deposits are situated in areas of stable paleotemperature field (200-400°C). Model of relation between grade and tonnage of deposits reveals significant negative correlation indicating that metals rapidly precipitated from fluids and accumulated in local high-graded shoots, are of a minor economic interest. Commercial reserves in ore deposits are formed by those metals that stay solved for a long time interval in fluids and are deposited by the end of ore-forming stages.