Experimental study of elements partitioning in equilibria melt–fluid at high pressure

I.F. Kravchuk

Vernadski Institute of Geochemistry, RAS, Kosygin St. 19, Moscow 117975, Russia.

Several parameters may exert an important influence on the composition of a flutd, derived from granitic magma: pressure, composition of fluid, melt chemistry. The information on composition of fluid is necessary not only for deducing of genesis of magmatic hydrothermal ore deposits but also for petrogenesis of felsic magma.

The aim of the study was to obtain the experimental data on partitioning of Na and K (the problem of origin of granites), of ore elements (for the development of magmatic model of ore deposits) at different pressures and compositons of systems. It was fundamentally important to clear the laws of chlorine partitioning between phases because most of the elements are bonded to chlorine.

The systematic experimental study at high temperature 800–1200°C and pressure 1–5 kbar were carried out in two types of high pressure apparatus. One of them is an externally heated horizontal two chambers bomb with very effective quenching. It was used up to 800°C and 2 kbar. The other apparatus is a typical gas bomb with internal heating up to 1300°C and 7 kbar.

Our major contributions to the research area are following:

Constants of K/Na exchange reactions between chloride fluids and magmatic melts of granite, granodiorite, and basalt have been obtained at 1–4 kbar. On the basis of the results a criterion of melt-magmatic or subsolidus nature of fluid has been formulated.

Mo, Zn, Cu gives the evidence for the different speciation Mo, Cu, Zn in fluid and also for opposite effects of pressure influence on partitioning of elements. These data are important in evaluating the ore bearing nature of fluids that produce magmatic ores by various mechanisms.

By means of the thermodynamic treatnent of data of NaCl partitioning between water fluid and melt NaCl activity coeffIcients in fluid at 800–900°C and 1–4 kbar were determined and the predominance of ionic form of NaCl in fluid was settled.