EXPERIMENTAL STUDY OF IRON-SULPHIDE AND SILICATE PHASE SEGREGATION UNDER ULTRASONIC INFLUENCE IN A CENTRIFUGAL FIELD .

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The determination of possible condition and mechanisms for the metal phases segregation from partial melting zones, its accumulation and movement to the forming Earth's and Moon's cores are the important problems. A simulation of the mechanisms migration of metal and sulfide phases under gravity and mechanical deformations, shock deformations and ultrasonic influence with the partial fusion of a model planetary substance (olivine-picrite mixture), was carried out in a high-temperature centrifuge. The separation of sulfides in the inter crystalline space is shown to be in an intimate relationship with degree of fusion of a silicate material. An occurrence of large-scale Earth's material melting processes is assumed at the early stages of Earth formation. This melting comprised the carbon, sulfide and phosphide containing rocks, which composed the high horizons of the mantle. The metal phases' occurrence is assumed for these rocks. Experiments temperature was 1400-1450^{o}C. Centrifugation was carried out on mixture of iron-sulfide and silicate matrix contained of olivine crystals and basic melt with different proportions. The initial mixture was: olivine crystals (85%) and basic melt (picrite) 10%; iron-sulfide melts 5%FeS (95%Fe, 5%S). The melt shall be affected simultaneously by centrifugal forces and ultrasonic influence with shock deformations was elaborated. For iron-sulfide phase accumulation in melt was used the 35 kHz ultrasonic transducer, disposed in of the centrifuge. The permeability increases manifold, if the silicate-metal system is subjected to mechanical deformations with ultrasonic influence and shock deformations. A number of papers deals with the experimental study of the silicate system are subjected to change in composition and deformations (McKenzie, 1984; G. Hirth' and D. L. Kohlstedt, 1995; E. H. Rutter and D. H. K. Neumann, 1995; Karakin A.V., Lobkovsky L.I., 1985; Karakin A.V., 1999; J. W. Hustoft and D. L. Kohlstedt, 2006; O.I. Yakovlev et al., 1978; K.P. Florensky et al., 1981, A.T. Basilevsky et al., 1977; E.B. Lebedev et al., 2009). Experimental results showed, that mixture consisting of olivine crystals, silicate and iron-sulfide melts, after being separated in a centrifuge, is differentiated in density at definite physico-chemical conditions. Separation is observed more intensive at lg f_{O2} some low IW. Separation is observed more intensive at mechanical deformation, ultrasonic influence, shock deformations of silicate matrix. Based on the data obtained, the mechanisms of the chemical differentiation of planetary bodies and of the formation in them of iron-sulfide cores in the thermal and gravitational fields are discussed.

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