

FERROMANGANESE NODULES: EVOLUTION OF MINERAL COMPOSITION IN NATURE AND IN EXPERIMENT

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To study the evolution processes of the mineral composition we refer to traditional methods of analysis and to experimental technique of modeling. The work was made in 2 spheres: a) characterizing of matter from different growth zones of nodules. It allowed us to follow the nodule matter evolution from a nucleation moment till a modern state; b) experimental modeling metamorphic processes at high temperatures and pressures in different media (neutral, acid, alkaline). On this basis one can predict the ways of nodule matter transformation. The investigation of variation in physical properties of predominant crystalline phase (10 Å phase) showed that reflecting coefficient and hardness values are increased along with coming from a periphery zones of nodules to a centre. That is a consequence of the degree of mineral crystallinity is increased in this direction and the growth from a centre to a periphery goes through several stages for a long period of time. On the basis of experimental modeling metamorphic processes, PT-diagrams for fields of crystalline phases stability were revealed. Hydrothermal processing samples in neutral medium results in crystalline phases of two structural types: olivine structural type (tephroite, fayalite) and spinel structural type (magnetite, hausmannite, NiMn_2O_4 , NiFe_2O_4 , CoFe_2O_4). In acid medium, fields of stability of crystalline phases are distinguished with the following mineral associations: hematite, tephroite - jacobsonite - braunite; tephroite - jacobsonite - hausmannite. In alkaline medium braunite, tephroite, jacobsonite, hausmannite are formed. The data obtained provides an opportunity to reveal main evolution tendencies in ferromanganese nodule phase constitution as well as to synthesize new crystalline phases from the initial matter of nodules.