NEAR-ORE HALOES OF HYDROTHERMAL-METASOMATIC DEPOSITS (Experimental data)

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Hydrothermal-metasomatic ore formation has a great role to play in formation of some deposits that are very important for industry such as the deposits of fluorite (Fl), barite (Bar), galenite (Gal), sphalerite (Sph), etc. These deposits are arisen as a result of substitution of certain rocks by ore minerals caused by the influence of ore-bearing hydrothermal solutions or other fluids on the rocks. Most of such deposits are referred to the layered strata of carbonate rocks with various anisotropic physical mechanical properties and contrasting composition. Amongst the deposits locating in the carbonate strata fluorite, barite, lead-zinc and a number of other ore formations are of great economical value. These mineralizion types may occur on various lithological levels of ore-bearing carbonate aggregates where change of lead-zinc ores into barite or fluorite mineralization is often revealed. Under natural conditions around vein and metasomatic ore bodies there is development of the areas of transformation of the substituting carbonate rocks practically everywhere. These zones are characterized by recrystalization of their carbonate mineral aggregates and redistribution of rock- and ore-forming components.

At experimental study of processes of hydrothermal-metasomatic ore-formation [1] regulations of formation of zones with higher contents of ore components were determined in the ore-containing rocks in dependence of thermal conditions and composition of the affecting solutions. Mineralogical and chemical zonality of mineralization is determined by the multicomponent composition of hydrotherms and various conditions of sedimentation of some solution components. Thus, during depositing of barite, sphalerite-galenite and complex barite-sphalerite-galenite ores in the areas of near-ore transformations of the carbonate rocks there is formation of vast halloes with anomalous contents of Zn, Pb and Ba which is several times as higher than the capacity of ore formations (Fig.).

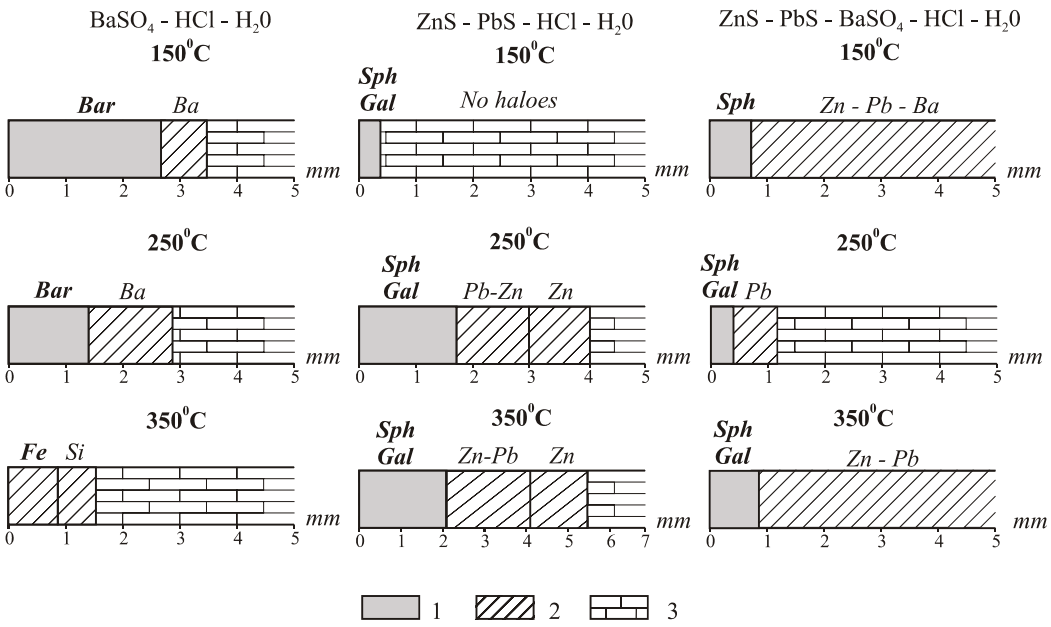

Fig. Experimental models of formation of mineralization and areas of near-ore haloes during interaction between chloride solutions and carbonate rocks in the temperature interval 150-350°C (1- ore mineralization, 2- the zones of the higher contents of ore elements in the containing rocks, 3- unchanged carbonate rocks).

Thus, vast zones (several times as higher than the capacity of ore formations) of anomalous contents of Zn, Pb and Ba by the scheme: Zn → Zn + Pb → Ba arise during formation of vast areas of barite-sphalerite-galenite ores in the areas of the near-ore transformations of the ore-containing carbonate rocks. The general view of the scheme of the hydrothermal-metasomatic conversions of the initial rocks within the temperature increase is the following:

- sphalerite → limestone with a higher content of Zn → silificated limestone with a higher content of Zn, Pb and Ba → unchanged limestone (150^0C). Capacity of the areas of sphalerite composition is 0.60mm with higher contents of Zn, Pb and Ba that makes up 4.0mm.
- galenite → limestone with higher contents of Pb → unchanged limestone (250^0C), capacity of the areas of galenite composition is 0.44mm, with higher contents of Pb -1.00mm.
- sphalerite + galenite → limestone with higher contents of Zn and Pb → unchanged limestone (350^0C). Capacity of sphalerite-galenite areas makes up 0.60mm, but with higher contents of Zn and Pb that is 3.0mm.

If basing on the model of hydrothermal-metasomatic mineralization under the conditions of the thermal gradient then, in this case, we can realize a model of formation of a vertical ore body with localization of barite mineralization and near-ore haloes of barite in the upper areas of the ore deposit, and lead-zinc mineralization with the haloes of Zn and Pb in its lower areas.

Distribution zonality of the elements in the near-ore hydrothermally transformed rocks, that is, regular change of the coordinations between two or several components in spreading, dip and capacity of ore areas are very important for geochemical prospecting of ore deposits.

The determined variations in the migration capacity of the ore-forming elements and zonality of their deposits are the evidence of probability of application of experimental methods of investigations for modeling of processes of formation of near-ore primary haloes and determination of lines of their zonality, that is of great value in theoretical and practical sense, and expediency of their application for development of single coefficients of zonality when interpreting geochemical anomaly.

The data obtained during experimental investigations on modeling of the processes of formation of hydrothermal-metasomatic mineralization of fluorite-barite-sphalerite-halenite composition provide opportunity to apply the considered methodical approaches for decoding of the conditions of formation and prognosis and other types of mineral raw.

Reference

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