CASSITERITE DEPOSITION UNDER FLUIDS MIXING: THE KHINGANSK TIN DEPOSIT AS AN EXAMPLE

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The study of genetic peculiarities of mineral- forming fluids, formed the Khingansk tin deposit, has been undertaken from the considerations, that role of processes responsible for cassiterite deposition, such as fluid-rock interaction, mixing and heterogenization of fluids, is here rather essential. It is determined by tectonical history of the Khingansk deposition formation, when large breccia zones of metasomatites with tin breccia lodes have been formed.

Analysis of hydrogen and oxygen isotopic composition of minerals, calculation of isotopic composition of water phase of fluids gave us possibility to reveal the main features of mineral formation process and to determine mixing of fluids of different genesis in the Khingansk hydrothermal system.

1. Cassiterite deposition during quartz- cassiterite- fluorite stage took place from the solutions with decreasing ^{18}O content, determined by coming meteoric changed waters into the hydrothermal system.
2. Dispersion of δ18O values in the discharge zone is the result of interaction of isotope light meteoric waters with surrounding rocks, before their entering the system, at different W/R (water – rock) values, controlled by structural irregularities of the deposit.
3. The highest ^{18}O values are found to be typical for the solutions, depositing the cassiterite ores; the calculations, fulfilled with new data on oxygen fractionation in the cassiterite – water system, showed the fluid in equilibrium with cassiterite is characterized by the values δ18O = 8,5 + 0,5 ‰ with lowering to 5,3 ‰ and to – 1,4 ‰ only for two cases. These data give possibility to suppose the predominance of deeply generated magmatogeneous fluid during the deposition of cassiterite ores. The reduced values are resulted from this fluid mixing with initially meteoric waters. The change of oxygen isotope composition of fluid in equilibrium with quartz is more wider, from 3,9 ‰ to –9,2 ‰. The relation between cassiterite and quartz δ18O values is not consistent with isotope equilibrium, that is in agreement with mineralogical data, testifying the early formation of cassiterite.
4. The very low deuterium content of mineral- forming fluid in equilibrium with quartz and chlorite witness to mixing of magmatogeneous fluid with great masses of isotope light meteoric changed waters. It is supposed that the very low δD values, calculated for fluid in the discharge zone (from – 139,4 ‰ to – 155,4 ‰) from chlorite data, may be partly due to following chlorite interaction with meteoric waters, coming into the hydrothermal system.
5. Influence of fluid heterogenization, found from microthermometrical fluid inclusion data, was not appreciable in isotope (H, O) composition. In this system the effect of meteoric stream was so strong, that it overrode the increase in isotope composition of water phase, causing by heterogenization process.