ROLE OF ORGANIC MATERIAL OF ENCLOSING ROCKS IN ORE FORMATION ON EXAMPLE OF OF CHROMITE OF ARCTIC URAL

MUROGOVA, R. N.[1], TRUPHANOVA, S. F.[1], TSHERBAKOVA, A. V.[2]
[1] VNIIYAGG, Ramenskoe, Moscow district, Russia.
[2] TsNIGRI, 113545, 129b, Varshavskoe shosse, Moscow, Russia.
E-mail: tsnigri@pol.ru

This work considers the possibility and character of participation of organic material from enclosing rocks in ore-forming processes in ultrabasites from alpine-type massifs. Chromite-bearing, serpentinous dunite containing accompanying sulphide and native mineralization is considered as an example. Dunite is taken from bore holes drilled on the Centralnoe deposit localised in south-west end of the Rai-Iz ultrabasic massif (Arctic Urals) which contain sedimentary and volcanic-sedimentary rocks of Riphean and Ordovician-Silurian age.

For determination of temperatures and redox conditions of mineral-forming processes a method of gas chromatography was chosen. A strategy of synchronous determination of hydrocarbon and non- hydrocarbon components in the range of 30-900°C was used with the analysis of gases every 20°C. Gases from primary melting (ore-silicates solid phase+gas) and secondary fluid (liquid+gas or gas phase) inclusions in olivine and gases from small inclusions in serpentine veinlets of rock were analysed. Three groups of inclusions contain fluids accompainying to three stages – crystallization of olivine and chromite, beginning of serpentinization of ultrabasites and main stage of this process.

According to results (Fig. 1) three main geochemical barriers (780-800°C, 610°C and 350°C) and a number of secondary ones are identified, where a change of chemical composition of fluids occurs.

Chromium is a typical oxidable element; therefore crystallization of chromite could occur when reducing conditions replaced the oxidizing ones. Fig. 1 shows that such situation could be realized at temperatures 780-800°C that does not disagree to temperatures of forming chromite ore in Centralnoe deposit measured by Jackson olivine-spinel geothermometer. The process proceeds at the low levels of the crust and supplementary free oxygen can be contributed to the system due to C=O relationship breakup. This relationship occurs in products of compaction of formiates and residues of carbon acids from deeply metamorphosed sedimentary rocks of Riphean age.

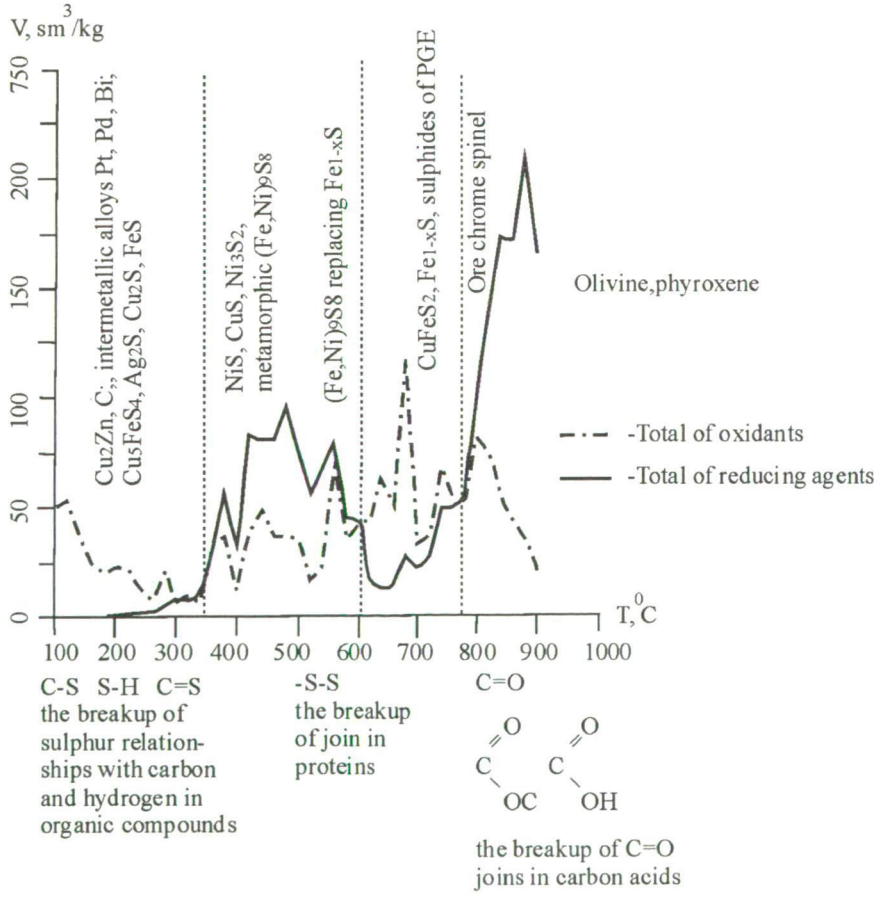

Fig. 1. The diagram of ore mineralogenesis in chromite-bearing dunite

Two other barriers correspond to formation of the main mass of sulfides and native metals localized in serpentine of dunites. Serpentinization of ultrabasites occurred in the course of cooling the ultrabasic massif and its moving throughout the palaeooceanic crust of the Urals. Final stages have been going on in conditions of upper horizons of the crust with the abundance of meteoric water. Appearance of big amount of sulfides points to the high activity of sulphur, whose additional entering in the system could proceed from enclosing rocks. It's known that breakup of bisulphide footbridge in residues of protein compounds occurs at 630-470°C while breakup of relationships sulphur with carbon and hydrogen in organic compounds occurs at temperatures 340-330°C, 240-220°C, 115°C and below. In ranges of 350-340°C and 320-290° reduced components are dominated in fluid and native metals could be formed.

Thus, we suppose that organic material from host rocks could participate in the ore-forming process in chromite-bearing ultrabasic rocks from alpine-type complexes .