

## ORE MINERALS IN SERPENTINITES ROCKS OF THE OPHIOLITE AT THE SOUTHEAST BIRJAND (EASTERN IRAN)

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The ophiolite complexes of Eastern Iran are potential source of a chromium, sulfide ore mineralization, gold and platinum group elements. The rocks units cropping out in the Birjand area consist of ophiolitic melange of upper Cretaceous age, flash of cretaceous-paleogene age, neogene conglomerates and young volcanic rocks. The ophiolitic complex rocks consist of harzburgites, dunites, pyroxenites, gabbro and diabbases. Serpentinization, listwaenitization, silicification and other types of alteration are widespread. According to chemical analyses, ICP, At.Ab, NAA and XRF, the contents of Cr, Ni and Au in serpentinite reach up to 0.5%, 0.3% and 0.35 ppm, respectively. The main minerals of serpentine group consist of chrysotile and antigorite (which displace olivine and pyroxene) sepiolite and chlorite. In serpentinites there were observed 3 groups of ore minerals, namely oxides (chromspinel, magnetite), sulphides (pentlandite, cupropentlandite, violarite, heazlewoodite, godlevskite and chalcopyrite) and native metals (awaruite, native copper). The determination of composition of ore minerals in serpentinites by EPMA (Kamebax 50-SX) have revealed that primary (magmatic) chromspinel contains Cr<sub>2</sub>O<sub>3</sub>- up to 32.52, Al<sub>2</sub>O<sub>3</sub> -up to 34.94, MgO- up to 15.81, FeO-up to 22.43 mas.%, the latter associates with olivine. The relict grain of initial chromspinel have been altered into secondary chromspinel (with contents of Cr<sub>2</sub>O<sub>3</sub>- up to 38.02, Al<sub>2</sub>O<sub>3</sub> -up to 18.56, MgO- up to 2.2 and FeO- up to 50.36 mas.%) by serpentinization. The above presented data show that during serpentinization aluminium and magnesium were lost from primary chromspinel. These are obviously linked in serpentine. During serpentinization, pentlandite had been replaced by cupropentlandite (with Cu from 6.59 to 17.77 mas. %) and violarite. In cupropentlandite content of Au is up to 0.049 mas.%. Other ore minerals that formed in serpentinization are awaruite, godlevskite, heazlewoodite and native copper. In awaruite there was revealed content of Ir up to 0.034 mas.%.