Occurrence of metasomatic monazite-xenotime inclusions in chlorapatites of Esfordi phosphate deposit

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Abstract: Apatite is the most common phosphate mineral in the Esfordi ore body. Euhedral crystal (2-20 cm) of the apatite occurs as an intergrowth in magnetite and hematite, vein and dike. There are two types of apatite in the Esfordi deposit, based on Petrographic studies: primary and secondary. Fresh and altered parts of primary apatite display dark and light color respectively using BSE images. EMP analyses demonstrate that primary apatites (light area) were chlorapatite in composition and have been partially changed into hydroxyle-flourapatite (dark area) by the metasomatic process. Lighter areas represent more Cl, SiO₂, Na₂O and LREE+Y enriched apatites. Monazite and xenotime inclusions in apatite can be classified into two types: primary (30-100 μm) and hydrothermal (5-20 μm). The hydrothermal inclusions are found in the dark area, apatite crack and along grain boundaries. The monazite and xenotime inclusions in the dark areas are enriched in LREE and HREE+Y respectively. Monazite-xenotime thermometer yielded a temperature of about 150-350°C for apatite metasomatism and hydrothermal monazite-xenotime formation, coincides with greenschist facies conditions.

Keywords: Esfordi phosphate ore body; chlorapatite; metasomatism; monazite; xenotime.

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