

Scandium-Bearing Minerals in Lateritic Nickel Ores of the Soroako Deposit in Indonesia

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Scandium (Sc) is included in rare earth elements in the broad sense although its geochemical behavior during magmatic differentiation and weathering is different from yttrium and lanthanides. Since scandium is produced as refinery by-product of a variety of mineral resources, little attention has been paid to dominant Sc-bearing minerals and deposits. The purpose of this study is to identify the most dominant Sc-bearing minerals in lateritic nickel ores consisting of limonite and saprolite ores. We present results of whole-rock analyses and microanalyses of the nickel ores from the Soroako deposit using EPMA and LA-ICP-MS.

Soroako nickel deposit is located in Sulawesi Island, Indonesia. Lateritic nickel ore bodies consist of limonite and saprolite ores underlaid by serpentized or fresh periodotite of the Miocene Sulawesi Ophiolite Belt. Limonite ores are low in Ni and high in Fe_2O_3 and Sc, whereas underlying saprolite ores are high in Ni and low in Fe_2O_3 and Sc. Results of whole-rock analysis of the nickel ores suggest a positive relationship between Fe_2O_3 and Sc contents. The limonite ores are dominated by goethite and presumably include a large quantity of poorly-crystalline or amorphous Fe oxides.

We performed quantitative analyses of single mineral grains and also mineral aggregates by EPMA and LA-ICP-MS to determine elemental compositions of each end-member because fine-grained minerals (micrometer to submicrometer) smaller than a laser spot size are too small to quantify elemental compositions of each mineral.

Results of microanalyses suggest that goethite is the dominant Sc-bearing mineral in the limonite ores. Scandium content of goethite ranges approximately from 80 ppm to 300 ppm in goethite. In contrast, Sc content in spinel group, serpentine, clays, and residual silica are significantly lower than that of goethite. This result is consistent with a positive correlation between whole-rock Sc and Fe_2O_3 contents of the studied nickel ores.