Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.26545

Geology and Geochemistry of Ni-rich Laterite Deposits in the Kopan Region, Northern Fars Province, Iran

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The laterite deposits in the Kopan region (e.g., Kopan, Rostami, and Tojordi deposits) are located within a tectonically deformed area, bounded by the Sanandaj-Sirjan zone (SSZ) to the north and the Zagros belt to the south, following an NS-NW trend. These deposits are hosted within the Late Cretaceous Kopan mafic-ultramafic complex, which comprises a variety of mafic to ultramafic igneous rocks including peridotite, andesite, and pyroclastic materials, and polymictic sedimentary rocks, with extensive alteration, including chloritization, serpentinization, carbonatization, and weathering. Nummulitic limestone deposits from the Paleocene-Eocene sequence overlie this complex.

Lateritization occurs on the ultramafic rocks of the Kopan complex, which are rich in serpentinized olivine and orthopyroxene. Key minerals identified in these laterites include chromospinell, limonite, hematite, serpentine, and garnierite. Geochemical analyses studies indicate a decrease in iron and aluminium oxides from the upper to the lower parts of the mineralized horizon. Nickel and cobalt concentrations are notably higher than other trace elements and exhibit a decreasing trend from the upper to lower sections. Kopan nickel laterites contain significant concentrations of nickel, cobalt, and zinc, with average values of 2031, 110, and 67 ppm, respectively. The highest nickel concentration is 4360 ppm within the laterite layer, which declines markedly towards the limonitic and saprolitic sections.

Korei laterites are notable for their high concentrations of nickel, titanium, cobalt, and zinc, with a maximum nickel concentration of 21043 ppm and an average of 12405 ppm in the laterite horizon, which decreases significantly towards the lower section. Variations in rare earth element (REE) content in the Kopan laterite sequence indicate relative enrichment in the upper laterite section, particularly for light rare earth elements (LREE).