SEG 2022 Conference: Minerals For Our Future

Nickel Mineralogy of the Historic Callenberg Ni-Laterite District, Saxony, Germany

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With the ever-growing demand for technology-critical resources (TCR), there is renewed interest in potentially underexploited historic occurrences of these metals. The Callenberg laterite district, Saxony, comprises the Callenberg North and Callenberg South sub-deposits, and was a vital source of Ni for East German industry during the late 20th century. Approximately 9.15 Mt of ore was extracted between 1960-1990, with average grades of 0.8-1% Ni. At present, an estimated resource with 34,500 t of contained Ni lies nearby at Kieferberg. Following mine closure, few studies on the Callenberg district were published (including the first description of gem quality crocoite specimens), however many of these are inaccessible and limited to German academic archives. Here we summarize the geology of the Callenberg laterites, and provide our own findings on Ni mineralogy in samples from the TU Bergakademie Freiberg Geoscience Collection.

The Callenberg district occurs within a 7 km NW-SE striking serpentinite complex in the SW Granulite Mountains, Saxony. Initial uplift of Variscan granulites during the Mesozoic led to significant weathering and lateritization throughout the Late Tertiary. Unlike most laterite deposits, Callenberg is a rare example of preserved ancient paleosols, found well outside the present-day tropics. Covered by up to ~20 m of overburden, the laterite ores vary in thickness from 1-20 m. They are classified as hydrous silicate laterites, and comprise serpentinized peridotite bedrock overlain by lower saprolite (hard, silicate-rich), upper saprolite (earthy), and goethite + hematite-rich limonite layers. Lower saprolite is Fe-poor (<10% Fe) and predominantly consists of Mg-chlorite, smectite, serpentine, magnetite, maghemite, chromite, and Mn-oxides. In contrast, the upper saprolite layer is Fe-rich (>10% Fe) due to abundant goethite, maghemite and hematite occurring with various phyllosilicates (chlorite, smectite and serpentine). The main hosts of Ni in saprolite are garnierite, which forms veins with quartz ± chalcedony, and serpentine minerals (lizardite-nepouite).