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The Lutshatsha and Nkonko mafic and ultramafic complexes in the Archean Kasai Craton (D. R. Congo): Geological setting, petrography and Ni-Cr potential

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The Congo Craton is one of the early cratonized Archaean basement areas in Central Africa and consists of a vast heterogenous granulitic complex extending for over 1,200 km between the Lomami River (24° E) and the Atlantic coast of Angola. The well exposed assemblages of the Congo Craton are the Kasaï Craton, the Ntem-Chailu Complex, the Tanzania Craton and the West-Nile Complex. The Archaean Kasaï Craton (ca 3.4-2.6 Ga), which is the core of the Congo Craton, exposes polyphase granulites, amphibolites, migmatites, grey gneisses and granitoids, and comprises (1) the Dibaya granite and migmatite complex, (2) a charno-enderbitic and granulite complex, (3) the Lueta gabbro-norite and charnockite complex, (4) the Sandoa-Kapanga granito-gneissic complex, and (5) the Kanda-Kanda tonalitic complex, which overall constitute the Kasaï-Lomami Supergroup [1,2,3]. Narrow streaks or stock-like bodies and enclaves of amphibolites and pyroxene-amphibolites are hosted within the Dibaya's granite-gneiss migmatite, between 5-7°S. Amongst these, the mafic-ultramafic Nkonko and Lutshatsha intrusions exhibit regular, dyke-like trends, and are neither folded or foliated. The Nkonko 'dyke' extends 20-25 km ENE-WSW (22°15'42"E to 22°34'12''E) and is a 3-700 m wide serpentinite, derived from dunite and harzburgite. The nearby Lutshatsha 'dyke' extends E-W for more than 50 km (22°02'36''E to 22°15'42''E) and is 1-2 km wide.

Petrographical and mineralogical composition data [4] allow classifying these rocks as pyroxenites and serpentinites, bearing mosaic enstatite (> 95 %), minor interstitial olivine and euhedral chromite grains (2-3 %), and traces of talc, plagioclase and serpentine; and as serpentinite, made up of lizardite (65-80 %), chlorite (13-20 %), hematite-goethite (3-9 %), chromite (3-6 %), and pyroxene, talc and mica (1 %). Olivine relicts have been completely replaced by net- or mesh-textural serpentine. Interstitial pyroxene has been replaced by serpentine displaying a linear bastite texture. Chlorite is highly intergrown with serpentine, replacing olivine and pyroxene. Hematite probably represents hematitized magnetite "dust" exuded during serpentinisation. Contents of serpentine and other secondary Mg-minerals (brucite, magnesite and talc) depend on the relative olivine and orthopyroxene content in the original rock

(dunite). Additionally, the introduction of Ca to the serpentine from the breakdown of clinopyroxene and Ca, Al and Na form plagioclase may give rise to tremolite, dolomite, septechlorite and chlorite. This fact explains why the western part of the Lutshatsha dyke which is predominantly composed of pyroxenite has preserved its original composition whilst the eastern and northern parts, originally composed of dunite are almost completely serpentinized.

Geophysical (electro-magnetic) surveys by Hunting (1970) and GEODAS (1997), as part of the Miniere de Bakwanga mining licence, covered their dyke-like geometries. Analyses of soil samples and drill cores suggest that Ni mineralization is of a 'residual concentration type' related to the serpentinization, with average grades between 1-2 % Ni and peaks of up to 3-4 % Ni. Chromite is found in top- and subsoils layers of the ultramafic intrusive bodies with grades of 2-5 % Cr_2O_3. Based on preliminary volume estimates and grades, inferred resources are estimated at 2 Mt of nickel ore and 4.5 Mt chrome ore. Thereby, the Lutshatsha and Nkonko deposits can be classified as relatively small.

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