## Nb-Ta Mineralisation in Pegmatite from the Amapá State, Brazil: First Constraints from U-Pb LA-ICP-MS Geochronology and Mineral Composition on Columbite-Tantalite

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Columbite-tantalite (coltan) concentrates have been produced by artisanal workers (garimpeiros) from pegmatite and granitic aplite in the Amapá State, Southern Guyana Shield for decades. However, limited information is available about the geological context in which the niobium-tantalum mineralisation was formed. Here, we report U-Pb ages and mineral composition for coltan obtained from a pegmatite that crosscuts mafic-ultramafic rocks of the Paleoarchean Bacuri layered complex, in the Vila Nova region. The pegmatite is highly weathered and consists of a mass of clay minerals containing centimetre-sized quartz and muscovite crystals.

Coltan grains are black and euhedral, with a few clusters of blocky crystals also observed. Their size varies between 200μm and 1mm in length. BSE images reveal that most coltan crystals are homogeneous or show subtle oscillatory zoning, marked by alternations between brighter zones, rich in Ta, and darker zones, rich in Nb. The EPMA data show that coltan grains are rich in Nb (avg. 42.4wt.%) compared to Ta (avg. 13.6wt.%) and exhibit notable variation in concentration between these two cations. However, Fe (avg. 12.3wt.%), Mn (avg. 2.1wt.%) and Ti avg. 1.1wt.%) show relatively uniform concentrations. Micro XRF analyses confirmed that coltan grains are generally homogenous, with some sub-grains varying in Nd and Ta values, and in a few lighter elements, including Ca, P and Al. The chondrite-normalised REE fractionation pattern is characterised by a strong enrichment in heavy rare earth elements compared to the light rare earth elements and a strongly pronounced negative Eu anomaly.

Forty-two U-Pb spot analyses of coltan yielded a weighted mean of 207Pb/206Pb for concordant analyses of 2026 ± 27 Ma (MSWD=1.3), which is close to the 2061 ± 2 Ma (n=84, MSWD=31) concordant age of monazite obtained from the same pegmatite sample. Therefore, the niobium-tantalum mineralisation in the Amapá State, Brazil, formed during the Transamazonian Orogeny.