

### **Spatial Variation of Flake Graphite Grade and Crystallinity in the Namapwia Prospect, Ruangwa District, Lindi, Tanzania**

**Mikidadi Shaha**<sup>1</sup>, Andrea Agangi<sup>1</sup>, Ryohei Takahashi<sup>1</sup>, Pearlyn Manalo<sup>1</sup>

<sup>1</sup>Akita University, Faculty of International Resource Sciences, Akita City, Japan

The Namapwia prospect, located in the Ruangwa district of southern Tanzania, forms part of the Eastern Granulite Nappe Complexes within the Neoproterozoic Mozambique Belt. In this study we examined the metamorphic evolution, crystallinity, and grade variation of flake graphite along the NE–SW strike in the Namapwia prospect. Field observations, petrography, Raman spectroscopy, X-ray diffraction (XRD), and total graphite content (TGC) data were used to evaluate crystallinity of graphite-bearing lithologies.

The prospect is divided into two zones based on mineral assemblages: a biotite-rich zone and a garnet-bearing zone. Graphite occurs in graphite metasandstone, graphite schist, garnet graphite schist, and quartzofeldspathic gneiss. Graphite is commonly disseminated or aligned along foliation planes, associated with quartz, plagioclase, garnet, biotite, and rutile.

Raman spectroscopy was used to estimate both graphitization degree and metamorphic temperatures. Estimated temperatures range from 420 °C to 500 °C, consistent with amphibolite facies metamorphism. R<sub>2</sub> ratio decreases from 0.45 in graphite metasandstone to 0.25 in garnet graphite schist, indicating progressive ordering of graphite structure along the strike from NE to SW. XRD crystallinity parameters support these trends, with crystallite sizes (L<sub>c</sub>) ranging from 600 Å to 1100 Å, and interlayer spacing (d<sub>002</sub>) values between 3.350 Å and 3.370 Å. Graphite schist and garnet graphite schist exhibit the highest crystallinity and graphitization.

TGC values also vary throughout the strike length. Graphite metasandstone in the northeast contains 1.4–1.8 wt.% TGC, graphite schist and garnet graphite schist in the central zone yield 2.2–2.8 wt.% TGC, while quartzofeldspathic gneiss in the southwest exhibits lower values (0.3–0.6 wt.% TGC). This distribution highlights a central enrichment zone controlled by lithology and metamorphic grade. Although graphite at Namapwia exhibits excellent crystallinity, its TGC values are relatively low. Further exploration is necessary to delineate additional zones of higher-grade graphite mineralization.