Unveiling Diamond Potential in the Meya Kimberlite Dyke: Petrographic and Thermobarometric Insights

Tenoch Galeana Cornejo[1]
[1]University Of British Columbia, Vancouver, Canada

This MSc research project aims to characterize distinct kimberlite units within the Meya dyke system in Sierra Leone and assess their diamond potential. Located adjacent to the Koidu kimberlite (West Africa's largest diamond mine) the Meya dyke is near vertical, 1–3 meters thick, and extend approximately 2.5 kilometers. Accurate geological models are essential for optimizing diamond exploration, and this study integrates mineralogical, petrographic, and geochemical data to define the origin, relationships, and economic relevance of the kimberlite units.

A central component of the project involves applying Ni-in-garnet thermometry to estimate the sampling depths of the kimberlite melts, using the local geotherm of 38 mW/m². Understanding these depths aids in evaluating the likelihood of diamond preservation and concentration. This research is supported by Meya Mining and SRK Consulting, with direct economic significance highlighted by the discovery of two high-value Type IIa diamonds from the Meya deposit, each valued at over USD $15 million.

The methodology includes detailed petrographic description of 45 thin sections from three kimberlite units (KIMB1, KIMB2, KIMB3), combined with scanning electron microscopy (SEM) for mineral identification and electron microprobe (EMPA) analysis of spinel, perovskite, and phlogopite to determine major-element compositions. Additionally, 111 garnet macrocrysts have been analyzed using LA-ICP-MS to quantify Ni concentrations, supporting thermobarometric modeling used to evaluate diamond potential. Laboratory work was conducted at the University of British Columbia between 2024 and 2025, with data interpretation and thesis completion expected by November 2025.