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Assessing Large (>3ct) Diamond Potential: Evidence from Diamond Paragenesis at Gahcho Kué Mine, Canada

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Diamond is a precious commodity in which value exponentially correlates with its size. Unlike precious metal deposits, the valuation of a diamond deposit depends on the grade, size and quality of the diamond recovered. Size is a significant factor, and Letšeng mine (Lesotho) has proven profitable solely by relying on large stones. Although large diamonds account for ~75% of revenue in several mines, economic projections and feasibility studies for new diamond mines rely on limited data on large stones. Typically, diamond parageneses (peridotitic vs. eclogitic vs. super-deep) is assessed by bulk samples dominated by small (< 3 mm) diamonds. Previous studies showed that eclogitic-type diamond may increase in proportion relative to peridotitic-type with increasing diamond size. This study aims to investigate whether the origin of small diamonds can be extrapolated to a population of large (>3 cts; 10-15 mm in size) diamonds.

In this study, we examine proportions of diamonds inclusions (DI) in offcuts of large diamonds and compare it with data for smaller diamonds (Siva-Jophy, 2020) from Gahcho Kué mine, Northwest Territories, Canada. Approximately 3000 offcuts from laser cutting of gem-quality, near octahedral diamonds, traditionally inaccessible, were chemically cleaned and screened for DI. Forty-nine diamonds contain inclusions of magnesiochromite, forsterite, sulfide, garnet, omphacite, enstatite, diopside, diamond, or magnesite identified by Raman spectrometry. Based on mantle petrogenesis, 87% of the diamonds are peridotitic, whereas 13% are eclogitic. Proportions of diamond parageneses and major element geochemistry of these inclusions, as well as the estimated mantle residence temperature of the diamonds, are consistent with those of smaller diamonds. Thus, the paragenetic distribution of small diamonds is broadly representative of the run-of-mine population that includes larger stones in Gahcho Kué mine.

Reference:

Siva-Jothy, W. (2020) Studies of inclusions and their host diamonds from the Gahcho Kué mine, Canada. University of Alberta.