Alluvial diamonds from Brazil: Where and what are their sources?

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Alluvial diamond deposits are widespread throughout Brazil, but so far very few kimberlitic sources for these diamonds have been located. Similarly, little is known about the composition of the lithospheric mantle beneath Brazil, which is the source of these diamonds. In order to gain insights into the characteristics of the lithospheric mantle sources and the depositional histories of Brazilian alluvial diamonds, sixty-eight diamonds and their associated mineral inclusions were studied in detail. The diamonds were recovered from alluvial deposits at Arenapolis (Mato Grosso), Boa Vista (Roraima), and Canastra (Minas Gerais).

The compositions of the mineral inclusions are similar for diamonds from all three deposits, and indicate that the diamonds formed in a strong to moderately depleted peridotitic mantle with minor involvement of eclogitic sources. The diamonds from the three deposits are indistinguishable based on their nitrogen contents (<10 to 1856 ppm), their aggregation states of nitrogen (0 to 100% B-centers), and their apparent zoning patterns. Similarities also exist in the stable carbon isotope composition of the peridotitic diamonds ($\delta^{13}C$: -2.0 to -8.9‰). Single diamonds from Boa Vista and Canastra have carbon isotopic compositions of -4.4 and -16.1‰, respectively.

Based on physical criteria [1], diamonds from Boa Vista are distinguishable from Arenapolis and Canastra diamonds. Boa Vista diamonds have a higher abundance of diamonds with green surface spots, which are caused by alpha-particle irradiation [2]. Diamonds from Boa Vista are also characterized by the complete absence of transport-related abrasion textures, unlike the diamonds from Arenapolis and Canastra, indicating that they are derived from a nearby kimberlitic source that has not been discovered yet.

References

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