# Genesis of diamond: A mantle saga—Distorted in the telling

BEN HARTE
Department of Geology, Edinburgh University, Edinburgh EH9 3JW, Scotland

In Meyer's (1985) recent saga on diamond genesis I was somewhat surprised to find Harte, Gurney, and Harris cast solely as the discredited proponents of the idea that diamonds are phenocrysts within erupting kimberlite. Thus Meyer said,

> Gurney et al. (1979) and Harte et al. (1980) maintain that diamonds are genetically related to early crystallization products of kimberlite within the upper mantle and are thus phenocrysts. (p. 344)

> Although Gurney et al. (1979) and Harte et al. (1980) consider diamond to be an igneous phase they relate its genesis directly to *the* kimberlite magma. *In view of the disparity between kimberlite ages and the age of diamond, growth from a kimberlite magma is untenable.* (p. 350; italics added)

Suggestions of the relationships between kimberlitic liquids and diamonds touched on by Gurney et al. (1979) and considered in some detail by Harte et al. (1980) focused on a possible explanation of the Ca-poor chemical characteristics of peridotite-suite silicate inclusions in diamond. The argument put forward rested on experimental phase equilibria and noted that melting of common peridotite xenolith material under appropriate $CO_2$-rich conditions, could give rise to minerals of appropriate diamond-inclusion compositions in equilibrium with a melt of essentially kimberlitic composition (as defined in the simplified experimental system). Harte et al. (1980) did not discount a genetic connection between the kimberlitic melt involved in diamond formation and the kimberlite whose subsequent eruption brought the diamonds to the surface, but they drew particular attention to the fact that *the kimberlitic melt they were discussing was not necessarily to be correlated with the erupting kimberlite.* They further noted that the overall variety of rock and mineral inclusions in kimberlites suggested different magmatic episodes with possibly quite different kimberlite liquids (in the broad sense) of potentially different ages. Meyer's (1985) indication of our views as simply favoring diamonds as phenocrysts in the erupted kimberlite is therefore incorrect; furthermore his apparent general view of "*the* kimberlite magma" as a simple magmatic system ignores other evidence (Harte et al., 1980; Harte, 1983). We hope the following quotations from (Harte et al. (1980) will clarify our suggestions in view of Meyer's misrepresentation.

> The kimberlitic liquid within which the peridotitic suite diamonds form at depth is not to be correlated exactly with the kimberlite magma which erupts into the crust. (p. 188)

> In addition it is clear from compositional features that the magma forming the peridotitic suite of diamond inclusions must be markedly different from that which gives rise to the common megacryst or discrete nodule suite of many kimberlites . . . ; yet there is evidence . . . that the megacryst-forming magma also gives rise to a kimberlitic magma. How these magmas relate to one another and the kimberlite sampled at the Earth's surface is obscure. Perhaps the initially upward moving magma picks up small pockets of other magma owing their existence to local $CO_2$-$H_2O$ concentrations (as is possible for the postulated kimberlite magma of the peridotitic suite diamonds), and the kimberlite emplaced in the crust may represent a mixed or composite magma as has been suggested previously. (p. 188)

> Furthermore, the possibility of melting upper mantle peridotite at the *T-P* conditions of shield geotherms in the presence of $CO_2$-$H_2O$ . . . might allow the persistence of small magma pockets associated with $CO_2$-$H_2O$ concentrations over long periods of time. (p. 182)

Finally I should like to point out that Richardson et al. (1984, p. 202), in their important paper documenting both model ages in excess of 3000 Ma and enriched isotope ratios for some diamond inclusions, explicitly acknowledge the Harte et al. (1980) model as a possible one that is compatible with the enriched character of the diamond inclusions.

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