

DESCRIPTIVE MODEL OF DIAMOND PIPES

By Dennis P. Cox

DESCRIPTION Diamonds in kimberlites diatremes and other alkaline mafic rocks.

GENERAL REFERENCE Orlov (1973), Dawson (1980), Gold (1984).

GEOLOGICAL ENVIRONMENT

Rock Types Kimberlites diatremes. Olivine lamproite (K-rich Mg-lamprophyre) and leucite lamproite.

Textures Pipes: porphyritic igneous texture. Breccias with inclusions of many rocks from mantle, basement and overlying sequences. Lapilli tuff locally fills upper levels of diatreme.

Age Range Most productive pipes are 80-100, 250, and 1,000-1,100 my. in age.

Depositional Environment Pipes intruded from mantle source under high pressure but with rapid quenching.

Tectonic Setting(s) Most pipes intrude cratonal areas, stable since Early Proterozoic. Some intrude folded cover rocks that overlie deformed cratonal margins. Pipes are not correlated with orogenic events but occur in areas of epeirogenic warping or doming and along major basement fracture zones. Some pipes occur at intersections of regional zones of weakness visible in LANDSAT or SLAR.

Associated Deposit Types Diamond placers.

DEPOSIT DESCRIPTION

Mineralogy Diamond, bort or carbonado (polycrystalline generally dark colored), ballas (spherulitic polycrystalline), and amorphous carbonado.

Texture/Structure Diamonds are sparsely disseminated as phenocrysts or xenocrysts in breccia. Mined kimberlites yield from 0.1 to 0.6 ppm diamond.

Alteration Serpentinization resulting in "blue clay" zones. Silicification and carbonate alteration of country rock near pipe; rarely, alkalic metasomatism forming K-feldspar and Na-amphiboles.

Ore Controls Diamond distribution is irregular and restricted to kimberlites or lamproite pipes and upward-flaring crater zones. Productive pipes are rare and, at present, can only be identified by their diamond content.

Weathering Pipes weather rapidly to form topographic depressions.

Geochemical Signature Cr, Ti, Mn, Ni, Co, PGE, Ba. Anomalous Ni, Nb, and heavy minerals pyrope, garnet, phlogopite, and Mg-ilmenite indicate nearby pipes. Lamproite pipes lack ilmenite.

EXAMPLES

African deposits	(Sutherland, 1982)
Western Australia deposits	(Atkinson and others 1984)
Wyoming-Colorado	(Lincoln, 1983)