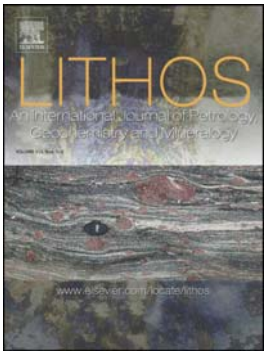

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Polycrystalline diamond aggregates from the Mir kimberlite pipe, Yakutia: Evidence for mantle metasomatism

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Introduction

Polycrystalline diamond aggregates remain the least understood of all diamond occurrences. This pertains not only to carbonado, the primary source of which is unknown (Ozima et al., 1991; Chopin, Sobolev, 1995; Kagi et al., 1994; Haggerty, 1999; Nadolinny et al., 2003) but also to the diamondites (framesites) from kimberlite pipes (Kurat, Dobosi, 2000; Dobosi, Kurat, 2002, 2010; Heaney et al., 2005; Orlov, 1977).

Diamond polycrystalline aggregates are represented by intimate sintered intergrowths of individual crystals of different sizes, mainly microcrystals (<1 mm), and are described in the literature as framesites, boarts (Orlov, 1977; Gurney, Boyd, 1982; Sunagawa, 1984), and also as a peculiar monomineralic rock, "diamondite" (Kurat, Dobosi, 2000). Such polycrystalline diamonds occur in minor amounts in several diamond mines of Yakutia (e.g., Aikhal, Yubileinaya, and Sytykanskaya pipes (Smelova, 1994), with the most abundant occurrences in the Mir pipe (Orlov, 1977; Sobolev, 1977; Bulanova et al., 1981; Kaminsky et al., 1981). In Africa, they have been reported from the Jwaneng and Orapa pipes, Botswana and the Venetia kimberlite, Republic of South Africa (Gurney and Boyd, 1982; Kirkley et al., 1994; McCandless et al., 1989; Jacob et al., 2000).

The first examinations of mineral inclusions *in situ* in the polycrystalline aggregates (diamondites) were performed by Kurat and Dobosi (2000) and Dobosi, Kurat (2002). The source of the samples is unknown, though most probably, they were from Botswana. With great difficulty, these authors polished some small surfaces on the aggregates, which enabled them to study the inclusions *in situ* using an electron microprobe and LA-ICP-MS. Among mineral inclusions in diamondites, garnets of peridotite paragenesis were found, which occur with chrome-diopside, as well as high-Mg garnets, with low contents of chrome, referred to as group A eclogites (Coleman et al., 1965). These garnets are not accompanied by clinopyroxene inclusions. On the basis of the results obtained, the authors conclude that the diamondites crystallized from a carbonate fluid/melt. Jacob et al. (2000) examined the polycrystalline-diamond aggregates from the Venetia kimberlite, South Africa. Among the mineral inclusions,