

NOBLE-METAL MINERALIZATION IN CARBONATITES FROM KOVDOR, KOLA PENINSULA, RUSSIA, AND PHALABORA, SOUTH AFRICA

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The noble-metal minerals (NMM) were first described in the carbonatite massifs at Kovdor (7 Pt, 10 Pd and 4 Au and Ag minerals) and Phalaborwa (one Pt, 8 Pd and 4 Au and Ag minerals). The NMM of both massifs are spatially and genetically closely associated with sulphide mineralization of these phosphosilicate-carbonatite complexes. In the Kovdor massif there is evidence that the earliest PGM (isoperplatinum, cooperite, sperrylite, mertieite I, II) may have crystallized simultaneously with pyrrhotite from a sulphide melt (~1190°C), whereas other NMM crystallized either with chalcopyrite (isomertieite, atokite, sobolevskite etc.) or galena (arsenopalladinite, zvyagintsevite, hessite, argentopentlandite) at lower temperatures. In Phalaborwa (Loolacop deposit), crystallization of NMM (sperrylite, cabriite, taimyrite, atokite, arsenopalladinite, majakite, mertieite II, electrum, tetraauricupride, gold, silver etc.) appear to follow the exsolution of chalcocite-chalcopyrite-bornite solid solution at decreasing temperatures, within a range of 350-400°C. In spite of the mineralogical similarities between the noble-metal mineralization of the Kovdor phosphosilicates and that of the Phalaborwa massif, there are significant differences in their compositional characteristics and crystallization temperatures. This may have been caused by some general compositional differences, e.g. the Phalaborwa mineralization is richer in copper and poorer in sulphur than that of the Kovdor massif and is similar to, for example, the typical Cu-Ni ores of the Norilsk deposits. (This work has been supported by INTAS grant 97-0722).