AN ULTRAHIGH PRESSURE MINERAL ASSEMBLAGE FROM THE LUOBUSA OPHIOLITE, TIBET

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In recent years UHP minerals, including diamonds, have been reported from a variety of environments including metamorphic rocks of older continental fragments, impact structures, and alpine ultramafic rocks. We confirm here the occurrence of a UHP mineral assemblage associated with podiform chromitites of the Luobusa ophiolite, Tibet. The assemblage was hand-picked from mineral separates but several crystals of the UHP minerals are attached to chromite grains, leaving no doubt as to their origin in the ophiolitic rocks. Identified UHP minerals include diamond, ringwoodite, moissanite (SiC), CrC and PGE alloys. These are associated with a variety of other alloys and native elements (SiFe, Si, Fe, Ni, Cr., Au, Ag, Cu, AuAg), many of which are suspected to be of similar UHP origin. Diamonds from Luobusa are chiefly clear, colorless octahedra[1] (Fig. 1), with high N aggregation states[2] confirming their natural origin and indicating a long residence time in the mantle. A few

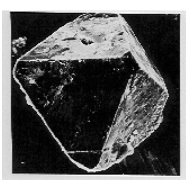

Fig. 1

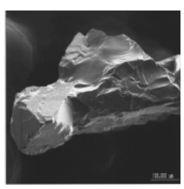

Fig. 2

have dark inclusions of Mg-silicate composition. Ringwoodite occurs as an octahedral grain attached to chromite (Fig. 2). It has a spinel structure (Fig. 3) and is composed entirely of Si, O, Mg and Fe, a composition confirmed by qualitative SEM analysis (Fig. 4). Moissanite occurs as abundant, small euhedral or broken crystals ranging from dark blue to greenish-blue or colorless. Primary Os-Ir and Pt-Fe alloys, interpreted to be of UHP origin, are included within chromite grains, whereas secondary PGE minerals and alloys occur along cracks where they are associated with a variety of sulphide minerals[3].

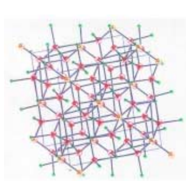

Fig. 3 a

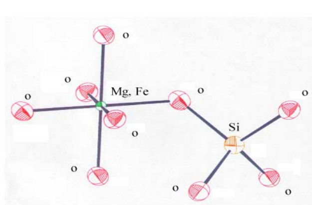

Fig. 3 b

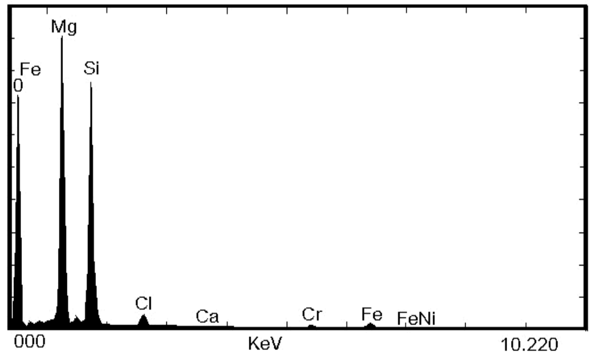

Fig. 4

This mineral association in the Luobusa chromitites is among the first confirmed occurrences of UHP minerals in oceanic lithosphere. There is no evidence that the Luobusa chromitites were formed at great depth, or subjected to high-pressure metamorphism[5]. Similarly, Collerson et al.[4] have recently reported micro-diamonds in majorite-bearing xenoliths from basalts of the Ontong-Java Plateau in the S.W. Pacific.

The UHP minerals in Luobusa are interpreted as xenocrysts incorporated into the chromitites during their crystallization. Preservation of the UHP minerals in this high temperature, relatively oxidizing environment is difficult to explain. Our preferred model calls for rapid diapiric rise of deep mantle rocks containing the UHP assemblage (>520 km for ringwoodite) to relatively shallow levels. At a later stage this material was incorporated into the mantle wedge above a subduction zone where it was invaded by boninitic melts which produced the chromitites on cooling[5]. Preservation of the UHP minerals in this environment may have been facilitated by inclusion in mantle xenolithic blocks and by relatively rapid crystallization and cooling of the host chromitites.

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