

**FA5-MS07-P01****Dissolution of Boron in Diamond under High Pressures: Experimental Evidences.**

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The discovery of superconductivity in polycrystalline boron-doped diamond (BDD) synthesized under high pressure and high temperatures [1] has raised a number of questions on the origin of the superconducting state. It was suggested that the heavy boron doping of diamond eventually leads to superconductivity. To justify such statements more detailed information on the microstructure of the composite materials and on the exact boron content in the diamond grains is needed. For that we used high-resolution transmission electron microscopy and electron energy loss spectroscopy. For the studied superconducting BDD samples synthesized at high pressures and high temperatures the diamond grain sizes are about 1–2 μm with a boron content between 0.2 (2) and 0.5 (1) at %. The grains are separated by 10- to 20-nm-thick layers and triangular-shaped pockets of predominantly (at least 95 at %) amorphous boron [2]. These results render superconductivity caused by the heavy boron doping in diamond highly unlikely. A comparison of these results with those for the B-C system recently reported in literature will be given in the presentation.

[1] Ekimov E., *et al. Nature*, **2004**, 428, 542. [2] Dubrovinskaia N., *et al. PNAS*, **2008**, 105, 11619.

**Keywords: boron compounds; diamond-like structures; transmission electron microscopy and diffraction**

**FA5-MS07-P02****High-pressure Behaviour of Inorganic Oxide Materials with Tl<sup>1+</sup> and Te<sup>4+</sup> Cations.**

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In this contribution, we will review our work on the high-pressure behaviour of inorganic oxide materials containing Tl<sup>1+</sup> and Te<sup>4+</sup> cations with lone non-bonded electron pairs using single-crystal x-ray diffraction in diamond anvil cells.

At atmospheric pressure, the coordination numbers (CNs) in TlO<sub>n</sub> and TeO<sub>n</sub> polyhedra range from 3 to 12 and from 3

to 7, respectively [1-3]. Low CNs are associated with the pronounced stereoactivity of the lone electron pair, with typically a few short bonds lying to one side of the cation and with very long bonds on the other side.

In the materials with low CNs around the Tl<sup>1+</sup> and Te<sup>4+</sup> cations, the compression mainly takes place in the region of the structure where the lone pairs are located. The long distances to oxygen atoms decrease, while the short ones are constant or even become slightly longer. The CNs usually increase, not necessarily being associated with a phase transition. This implies the pressure-induced suppression of the stereochemical effect of the lone electron pairs [4,5].

On the other hand, the presence of the lone pairs does not influence the high-pressure behaviour of the materials in which the cations have high coordination numbers. For instance, the effect of pressure on the crystal structure of Tl<sub>2</sub>SeO<sub>4</sub> (*Pm**cn*, *Z* = 4) with two non-equivalent Tl<sup>1+</sup> cations surrounded by nine and eleven oxygen atoms results in the compressibility mechanism already observed in other compounds with the β-K<sub>2</sub>SO<sub>4</sub> type structure [6].

[1] A.F. Wells, *Structural Inorganic Chemistry*, Clarendon Press (5<sup>th</sup> edition), Oxford, **1984**. [2] A.V. Marukhnov, D.V. Pushkin, V.N. Serezhkin, *Russ. J. Inorg. Chem.* **2007**, 52, 203. [3] K. Friese, G. Madariaga, T. Breczewski, *Acta Cryst. C* **1999**, 55, 1753. [4] A. Grzechnik, K. Friese, *Acta Crystallogr. C* **2008**, 64, i69. [5] A. Grzechnik, K. Friese, *J. Solid State Chem.* **2009**, in press. [6] A. Grzechnik, T. Breczewski, K. Friese, *J. Solid State Chem.* **2008**, 181, 2914.

**Keywords: oxides; inorganic stereochemistry; high pressure**

**FA5-MS07-P03****Stability of Xenon Oxides and Xenon Silicates at High Pressures.**

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Xenon is a noble gas and is quite inert at ambient conditions. Although a few compounds of xenon fluorides have been found, experimental and theoretical high pressure studies on the systems Xe-C and Xe-F did not find a tendency of xenon to form alloys. Two xenon oxides (XeO<sub>3</sub>, XeO<sub>4</sub>) are known at atmospheric pressure. Both of these compounds are unstable and decompose explosively at room temperature. There is growing evidence that noble gases, especially Xe, may become reactive under pressure. The possibility of formation of stable xenon oxides and silicates could explain the “missing xenon” paradox, i.e. that the amount of Xe in the Earth’s atmosphere is an order of magnitude below predictions based on a model assuming that noble gases cannot be retained in the deep Earth. In fact, there is new