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Structural transformations of boron trioxide under high pressure and high temperatureDongliang Chu, Hongan Ma^{*}, Jian Wang, Lixue Chen, Xiaopeng Jia^{*}

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Abstract

A systematic study of boron trioxide under high pressure and high temperature (HPHT) was conducted using a Chinese multi-anvil high-pressure apparatus (CHPA). The HPHT phase diagram was determined using X-ray diffraction measurements. Under high pressure (3.6–5.5 GPa) and low temperature (below 450 °C), the boron trioxide grains were reduced to the nanometer size and the hardness reaches to 13.9 GPa (5.5 GPa and 450 °C). The boroxol rings were produced only in the glass phase that was transformed from the α -B₂O₃ phase under HPHT. And the formation mechanism of boroxol rings was discussed according to Raman spectrum and crystal structure of α -B₂O₃ and β -B₂O₃.

Keywords: B₂O₃, Phase diagram, HPHT, Hardness, Raman spectrum, Boroxol rings

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