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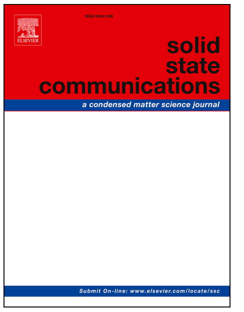

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Abstract

The lattice parameters of two boron subnitrides, $B_{13}N_2$ and $B_{50}N_2$, have been measured as a function of temperature between 298 and 1273 K, and the corresponding thermal expansion coefficients have been determined. Thermal expansion of both boron subnitrides was found to be quasi-linear, and the volume thermal expansion coefficients of $B_{50}N_2$ (15.7(2)×10^{-6} K^{-1}) and $B_{13}N_2$ (21.3(2)×10^{-6} K^{-1}) are of the same order of magnitude as those of boron-rich compounds with structure related to α-rhombohedral boron. For both boron subnitrides no temperature-induced phase transitions have been observed in the temperature range under study.

Keywords : *A. Boron subnitrides; C. X-ray diffraction; D. Thermal expansion*

I. Introduction

Boron-rich solids are hard refractory compounds with superior thermal stability, excellent chemical resistance and outstanding mechanical properties [1]. Such fascinating combination of physical and chemical properties makes these materials promising for advanced superhard tooling solutions. High-speed machining leads to a high thermal load and considerable tool heating and may result in material failure. Thus, information on phase stability and thermal properties at high temperature is of crucial importance for producing new tool materials with increased productivity.

Rhombohedral $B_{13}N_2$ and tetragonal $B_{50}N_2$ boron subnitrides have been recently synthesized by crystallization from the B-BN melt at pressures of about 5 GPa [2-4]. Both subnitrides are refractory [4,5], low-compressible [6,7] and superhard [8,9] phases. In the present work thermal expansion of boron subnitrides has been studied in the 298-1273 K temperature range at ambient pressure by *in-situ* synchrotron X-ray powder diffraction.

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