Abstract Submitted
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High-pressure high-temperature behavior of polymer derived amorphous B-C-N[1] S. BHAT, S. LAUTERBACH, D. DZIVENKO, H. KLEEBE, R. RIEDEL, TU Darmstadt, Germany, C. LATHE, GFZ Potsdam, Germany, L. BAYARJARGAL, B. WINKLER, Goethe University Frankfurt, Germany, M. SCHWARZ, E. KROKE, TU Bergakademie Freiberg, Germany — Dense diamond-like BCN compounds are of interest due to their extreme hardness and predicted exceptional thermal and chemical stability superior to diamond and c-BN. Here, we report on high-pressure high-temperature (HP-HT) behavior of amorphous BC_2N and BC_4N – potential precursors for HP-HT synthesis of diamond-like BCN. Prepared via hydroboration reaction of piperazine borane and pyridine borane, respectively,[2] amorphous BC_2N and BC_4N are characterized by well-mixed B-N, C-C and C-N bonds, confirmed by XPS analysis. These BCN compositions were subjected to pressures between 5-24 GPa and temperatures up to 2000°C using multi anvil press, toroid press and laser-heated diamond anvil cell (LH-DAC). In- and ex-situ X-ray diffraction reveals decomposition of BC_4N to graphite and h-BN between 5 to 12 GPa above 700°C, in contrast to BC_2N which remains amorphous up to 1600°C. Examination of the recovered LH-DAC samples using HR-TEM, EELS and EDS, indicates a tendency of BC_2N to transform into a mixture of c-BN (micron size) and nanocrystalline diamond between 20-24 GPa and 1500-2000°C.

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[2]R. Riedel, J.Bill, and G. Passing, Adv. Mater. 3 (1991) 551.

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