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Shockwave Processing of Composite Boron and Titanium Nitride Powders[1] MATTHEW T. BEASON, I. EMRE GUNDUZ, Department of Mechanical Engineering, Purdue University, ALEXANDER S. MUKASYAN, Department of Chemical and Biomolecular Engineering, University of Notre Dame, STEVEN F. SON, Department of Mechanical Engineering, Purdue University — Shockwave processing of powders has been shown to initiate reactions between condensed phase reactants. It has been observed that these reactions can occur at very short timescales, resulting in chemical reactions occurring at a high pressure state. These reactions have the potential to produce metastable phases. Kinetic limitations prevent gaseous reactants from being used in this type of synthesis reaction. To overcome this limitation, a solid source of gaseous reactants must be used. An example of this type of reaction is the nitrogen exchange reaction (e.g. B + TiN, B + Si_3N_4 etc.). In these reactions nitrogen is "carried" by a material that can be then reduced by the second reactant. This work explores the possibility of using nitrogen exchange reactions to synthesize the cubic phase of boron nitride (c-BN) through shockwave processing of ball milled mixtures of boron and titanium nitride. The heating from the passage of the shock wave (pore collapse, plastic work, etc.) combined with thermochemical energy from the reaction may provide a means to synthesize c-BN.

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