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A NEW DYNAMIC POWDER CONSOLIDATION TECHNIQUE USING SHOCK WAVES

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Some techniques for shock consolidation of powders have been developed over time. This sort of consolidation is used for many purposes, including the synthesis of diamond from carbon powder. In this work, a new configuration for dynamic consolidation is proposed. It consists of three coaxial tubes, with a conical cover made of explosive at the top of the device. The inner tube contains the powder to be compacted. The second is accelerated towards the first in order to collapse it. The third confines the explosive. A conical cap at the top of the device triggers the explosive. For an initial evaluation, the explosives TNT and B Composition were assumed. Preliminary analytical results by the impedance matching method indicate that maximum pressures of 35.44 GPa and 48.16 GPa could be achieved using TNT an B Composition, respectively. Maximum temperatures around 1600 K and 2500 K for TNT and B Composition, respectively, are expected. These pressure and temperature values are adequate for transforming graphite into diamond. Preliminary Rietveld refinement indicated that nanodiamond is a fraction of approximately 54% of the detonation resulting powder.