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The Effect of Simultaneous Shear and Pressure Loading On Nitrogen-rich Energetic Materials[1] FARHAD FOROHAR, VASANT JOSHI, DAN WILSON, JARED GUMP, United States Navy — Current research in energetic material is focused on synthesis of high density materials. Efforts to obtain metastable high pressure and high temperature states of nitrogen using Diamond Anvil Cell (DAC) have indicated that some high density compounds may physically exist, but recovery of these materials at atmospheric pressure and temperature is still elusive. Stable poly-nitrogen compounds can be theoretically achieved by attaching them to non-nitrogen atoms. Use of combined pressure and shear is a new approach to transform material to metastable condition easier than long duration-pure pressure application of force. This new method is being applied in an attempt to synthesize and recover novel energetic materials from pre-synthesized precursors. Nitrogen rich precursors used in the present study include ammonium azide (N_4H_4), di-amino-tetra-azidocyclotriphosphazene ($P_3N_{17}H_4$), and hexa-azidocyclotriphosphazene (P_3N_{21}). In order to get intramolecular interaction, co-crystallizations of mixtures were also made and subjected to pressure-shear loading. Successful decomposition of materials at low pressure has been achieved for some precursors. Additionally, the effects of pressure and shear on generating poly-nitrogen on carbon nanotubes were studied. Experimental fixture, method, results and analysis of recovered products will be presented.

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Farhad Forohar
United States Navy

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