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The Promise and Challenge of Extended Solids of Nitrogen JENNIFER CIEZAK-JENKINS, TIMOTHY JENKINS, JONATHAN BENNION, US Army Rsch Lab - Aberdeen — The response of nitrogen to extreme conditions has attracted great interest since the predictions that nitrogen would transform into a nonmolecular phase at pressures less than 1 Mbar. Nitrogen is of particular interest due to its promising potential as a high-energy-density material and it has been suggested its energy release may be roughly three times that of a traditional energetic materials. In an effort to increase the metastability of the extended solid, recent studies have focused on mixing, or doping, the nitrogen with small amounts of secondary gases, such as hydrogen or carbon monoxide. It was been postulated the secondary gas would passivate the terminal ends thus increasing the stability of the nitrogen extended solid. Our group was the first to demonstrate such an approach could be used successfully to decrease the transition pressure for the formation of the nitrogen extended solid through doping with hydrogen. Although recent studies on nitrogen/hydrogen mixtures by other research groups have also observed several non-molecular nitrogen/hydrogen structures, recovery of these materials to ambient conditions has not yet been demonstrated. In this talk, I will describe our progress in the study of the synthesis, characterization, and recovery of extended solids of nitrogen from high pressure conditions from nitrogen/carbon monoxide mixtures. I will also detail results from our closely coupled modeling and simulation efforts and discuss how these results help guide our experimental efforts.

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