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High Temperature Experiments By Using Porous Mixtures at the Dynamic Compression Sector at the Advanced Photon Source GERRIT SUTHERLAND, TIMOTHY JENKINS, NICHOLAS LORENZO, ERIC JOHNSON, US Army Rsch Lab - Aberdeen Proving Ground — There is a desire to study the high temperature state of nanocrystalline diamond and to perform diffraction measurements. Our paper will focus on the technique to achieve the high temperatures. The samples were pressed to shape and were a mixture of Viton plastic, nanodiamonds, and hollow glass spheres. Simulations were used to assist in the design of experiments and incorporated equation of state (EOS) and models that follow. First, mixture theory to calculate a fully dense Hugoniot (Mie-Gruneisen EOS) for the ND/Viton mixture. Second, a P-alpha model enabled pressures and temperature predictions for porous ND/Viton mixtures. Predicted temperatures were well in excess of the melting temperature, as provided by the diamond phase diagram, for samples impacted by copper projectiles traveling at 5.3 km/s. We expect that this technique can be used allow powder diffraction measurements over large portions of a material's pressure-temperature phase space. Also, preliminary experimental diffraction measurements for nanodiamond mixtures will be presented.

Gerrit Sutherland
US Army Rsch Lab - Adelphi

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