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**Progress on Understanding Structure and Compression of Laser Ramp-Compressed Matter into the Terapascal Pressure Regime**[1]

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Recent results from x-ray diffraction experiments at the Omega and NIF laser facilities on dynamically-compressed Sn, Ta, MgO, Pb and diamond will be presented. In order to relate laser ramp-compression results to the equilibrium phase diagram, it is necessary to understand the affects of the rapid compression on the phase transitions, microstructure and temperature of a material. To accomplish these measurements, a number of technical challenges must be overcome. The stress profile and history and the temperature of the sample need to be adequately controlled to make a measurement in a highly-compressed solid state, requiring precise laser pulse shaping and timing. Accurate understanding of the spectral emission from a plasma created during the laser ablation process is required in order to filter this emission and produce high contrast diffraction images. Progress towards understanding and resolving these scientific and technical issues will be discussed along with the experimental diffraction results.

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