

UNIVERSITY OF SOUTH FLORIDA
DEPARTMENT OF PHYSICS
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Diffraction, Explosives, and Dynamics at High Pressure †

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ABSTRACT

Compression produces many types of changes in materials. These can be studied by many spectroscopic and diffraction methods: electronic, Raman, infrared, and Mössbauer-excitation vibrational spectroscopy; X-ray and neutron diffraction; and other X-ray inelastic scattering approaches as well as modeled by ab initio and other methods. At HIPSEC, we apply these methods to problems in:

High-Pressure Science: to study structures, chemistries, thermal and mechanical properties of materials to pressures more than 106 atmosphere at temperatures from absolute zero to > 8000 °C, e.g. structures and dynamics of Sn and Fe: Sn alloys.

Detonation Chemistry at High Pressures: to understand explosions by determining EOS of explosives and by recovering/identifying decomposition products at high pressures, e.g., new diffraction methods used to characterize the shear-induced transformation of the energetic material, PETN, near 5 GPa.

Theory and Simulation: to develop and test models of these experiments, e.g., phonon spectra of Sn

Geoscience: Experimental and theoretical mineral physics and geophysics, e.g., silica and silicas at high pressures.

† Contributions to studies described in this talk by L. Borkowski, C. Chen, M.B> Denton, P. Dera, R. Downs, H. Giefers, C. Gobin, Y. Ke, B. Kiefer, Y. Lee, K. Lipinska-Kalita, J. McClure, M. Pravica, W. Pravica, S. Rudin, O. Tschauer, E. Tanis, B. Yulga, and the staff of HPCAT, APS, and ESRF are gratefully acknowledged.

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