Condensed Matter / Biophysics Seminar

Thursday

November 13

4:00 P.M.

Rm 184 NSH

Phonon Dispersion Relations and Phonon Density of States by Inelastic X-ray Scattering Techniques

Dr. Esen Ercan Alp, Advanced Photon Source, Argonne Natl Laboratory

Synchrotron radiation based inelastic x-ray scattering and spectroscopy techniques are used to study the magnetic, electrical and chemical structure of materials, and their dynamical properties under high pressure and at extreme temperatures. I will present the recent developments in experimental approaches, data analysis, and applications to materials like iron pnictide superconductors, iron oxides and iron alloys, nanoparticles, buried interfaces and thermoelectric materials like skutterudties and clathrates.

Measurement of phonon dispersion relations and phonon density of states with inelastic x-ray scattering is a useful tool for investigating thermoelastic properties of materials of interest in condensed matter physics, geophysics and mineral physics, materials science, and chemistry. Today, it is possible to measure phonon density of states under pressures exceeding several megabar, and at temperatures between 4-4000 K. These new instruments allows extraction of Debye temperature and Debye sound velocity, compressional and shear sound velocity, force constant, elastic constants, Grunesien constant, Young's modulus and many related thermodynamic parameters.

Acknowledgements

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