Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Pressure-Raman study of optical phonon anharmonicity and metastable phase in ^{68}Zn^{76}Se[1] R.E. TALLMAN, B.A. WEINSTEIN, Physics Department, SUNY at Buffalo, NY, R. LAUCK, M. CARDONA, Max Plank Institut fur Festkorperforschung, Germany — The effects of hydrostatic pressure on the one- and two-phonon Raman spectra of isotopic purity ^{68}Zn^{76}Se are studied to 15GPa at 300K. With increasing pressure the TO-TA(X,K) difference-mode shifts rapidly to higher energy, moving above the 2TA overtone band at 5.8GPa with no significant 4 -phonon mixing. Above 10GPa, the one-phonon TO(Γ) peak broadens rapidly, reaching $\sim 60\text{cm}^{-1}$ FWHM and overlapping both TO-TA(X,K) and LO(Γ). After the sample undergoes the forward and reverse high-pressure transitions, the sphalerite-structure Raman features return (including the strongly broadened TO(Γ) peak) and a new sharp line attributed to a metastable ZnSe phase appears. The TO(Γ) broadening in ZnSe is much stronger than that due to pressure-tuning of the anharmonic decay TO(Γ) => TA+LA(X,W,K) in GaP and ZnS.[1] Our results suggest that the resonant anharmonic interactions in ZnSe may be strongly enhanced by spatial confinement and disorder in the domains of nucleating phases. [1] J. Serrano et. al., Phys. Rev. B69, 014301(2004).

[1]Work partially supported by University of Buffalo CSEQuIN Center.

Robert Tallman
SUNY Buffalo

Date submitted: 07 Dec 2005 Electronic form version 1.4