Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Supplementary Information

Energy Dispersive Anti-anharmonic Effect in Fano Intervened Semiconductor: Revealing through temperature and wavelength dependent Raman scattering

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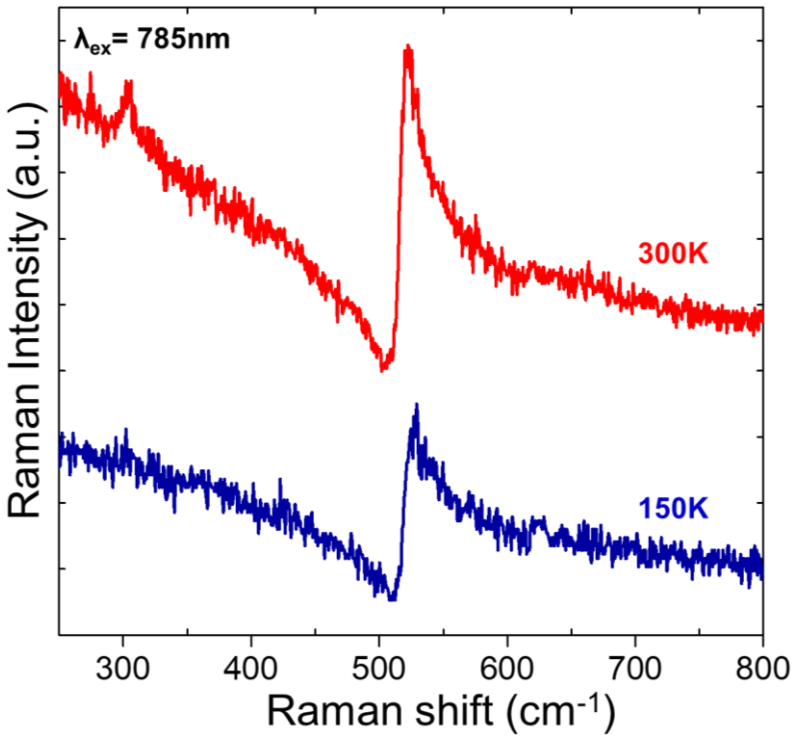

Figure S1: Experimentally observed Raman spectra at lowest temperature (150K) and room temperature (300K) recorded using 785nm excitation laser.

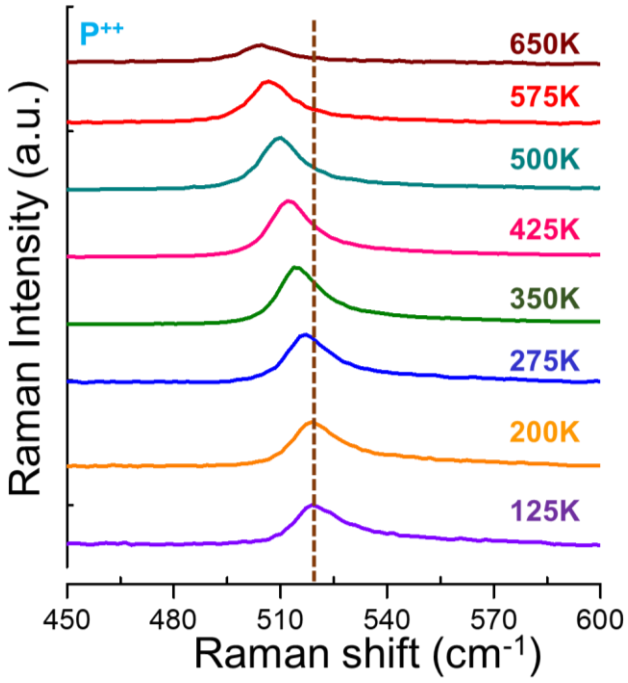

Figure. S2: Temperature-dependent Raman spectrum of heavily doped P^{++} sample excited by 532 nm Laser.

- Analytical modelling:

The Raman spectra of heavily doped materials (silicon) gets effected by the strength of electron-phonon coupling which can be given as Eq1:

$$I(\omega) = \frac{(q+\varepsilon)^2}{(1+\varepsilon^2)} \qquad \text{(S1)}$$

Where $\varepsilon = \frac{(\omega-\omega_0)}{\Gamma/2}$, q is the strength of electron-phonon coupling and Γ is the linewidth of the Raman spectra.

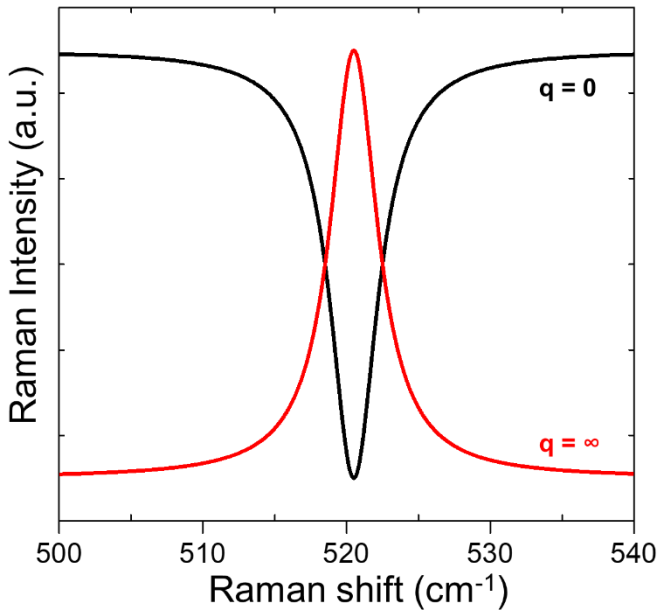

Figure. S3: Theoretical generated Raman line-shape for the different values of q, red and black spectra correspond to the zero and infinity, respectively.

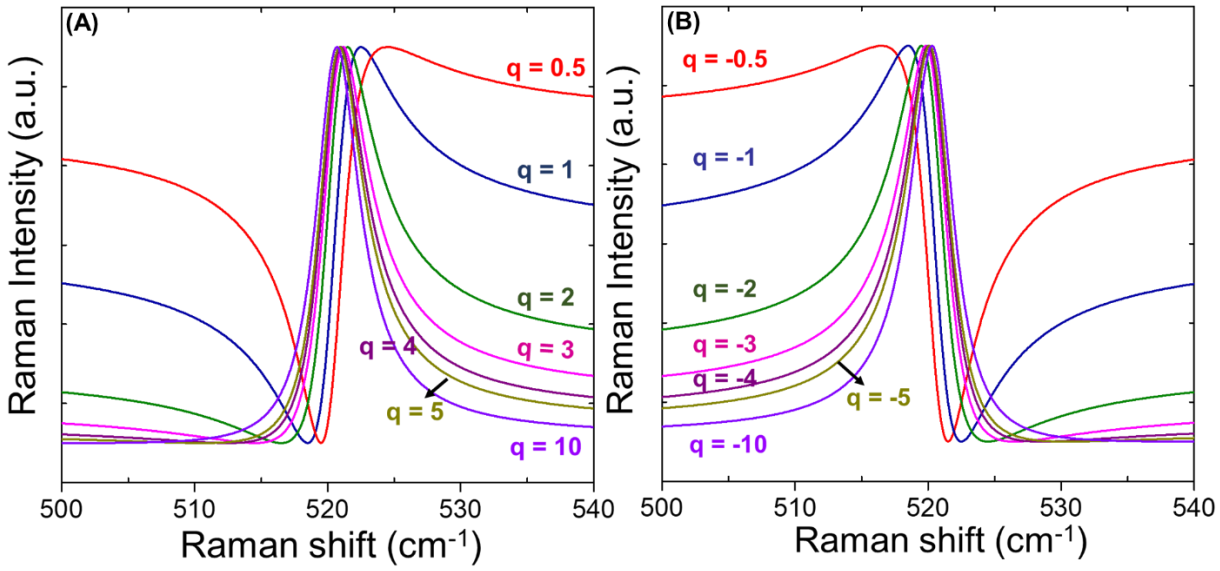

Figure. S4: Theoretical generated Raman line-shape for the different (positive & negative) values of electron-phonon coupling parameter q.

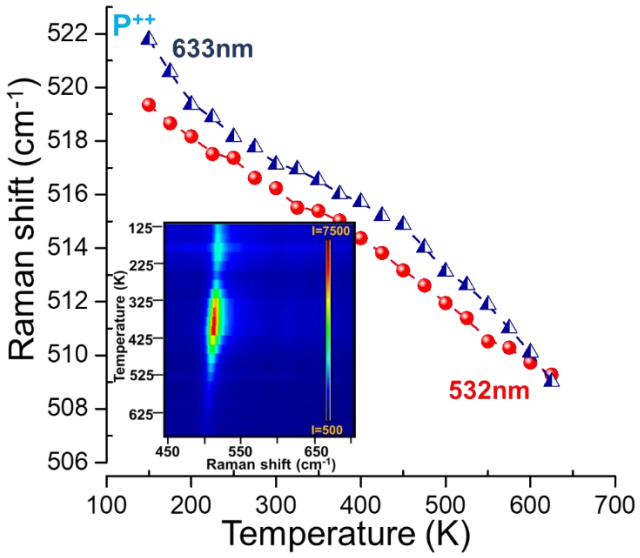

Figure. S5: Variation in Raman shift with temperature for P^{++} sample for different excitation wavelengths, blue curve is at 633 nm wavelength and red curve corresponds to 532 nm, respectively, inset shows the Raman thermal map.

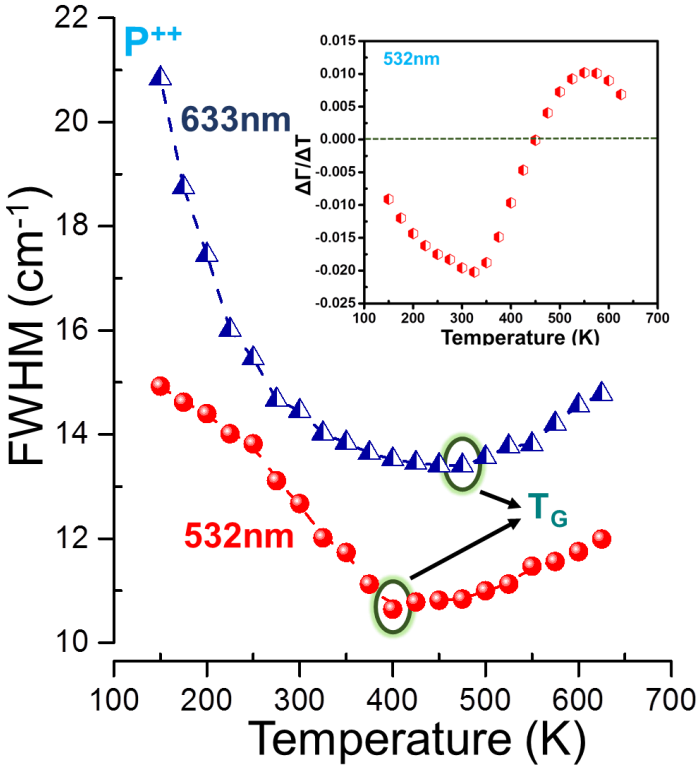

Figure. S6: Variation of Raman linewidth with temperature for heavily doped P^{++} sample at different wavelength, blue curve is at 633 nm wavelength and red curve corresponds to 532 nm, respectively, inset shows the slope of FWHM with temperature.