**Abstract**

In this research work, Samarium based Chalcogenides are studied for structural, vibrational and thermodynamic properties. The structural optimization is performed by using Generalized Gradient Approximation as an exchange correlation potential in Density Functional Theory (DFT) and vibrational properties are computed by using norm-conserving Martins–Troullier pseudo-potential in Density Functional Perturbation Theory (DFPT). The Quasi Harmonic Debye model is used for the investigation of thermodynamic properties in temperature range 0–1000 K in Gibbs-code. There is no imaginary phonon frequency in phonon dispersion curves of SmS, SmSe and SmTe proving the dynamical stability. SmS has the largest while SmTe has the smallest phonon band gap which somehow suggests the polar property of these materials. For all Chalcogenides, acoustic phonon modes near the gamma point have a linear behavior. At low temperature, Cv is a function of T3 while for higher temperatures it asymptotically tends to a constant as expected.