# Electronic mechanisms of microhardness enhancement in $Pb_{1-x}Sn_xTe$ based alloys.

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This communication is concerned with the dramatic increase of the microhardness of *p*-type PbTe alloys with a hole concentration higher than $5x10^{18}cm^{-3}$. This anomaly stands out on the background of other investigated *n*-type compositions (up to $10^{20}cm^{-3}$) and *p*-type compositions up to $10^{18}cm^{-3}$ that keep a constant microhardness value of ~30HV. Two possible mechanisms are discussed. The first deals with the elastic interaction between dislocations and impurities that have a larger covalent radius than the sub-lattice vacancy. The other correlates the hardness enhancement to the presence of a second valence band of heavy holes in PbTe and which begins to fill up at the same concentration. By considering these mechanisms, it was concluded that from mechanical stability standpoint, it is recommended to use *p*-$Pb_{1-x}Sn_xTe$ compounds rather than *p*-type Na-doped PbTe compounds, in practical thermoelectric applications in spite of the lower thermoelectric figure of merit of the former.

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