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The Effect of Phonon Drag of Charge Carriers in $In_{1-x}Ga_xSb$

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Abstract: The temperature dependencies of the thermal power a_0 and thermal conductivity κ in two samples of $In_{1-x}Ga_xSb$ (x=0.65 and 0.45) doped by {Te\sim } 0.001 at%, with electron concentration n = 5.9 \cdot 10^{16} and 1.3 \cdot 10^{17} cm^{-3} (at 100K), have been investigated. It is shown that in $In_{0.35}Ga_{0.65}Sb$ a_0 increases with decreasing T below 50K. At 14K a_0 passes through maximum and it falls sharply with decreasing T. It is shown that the maximum value of a_0 is in agreement with the maximum value of κ . In $In_{0.55}Ga_{0.45}Sb$, starting from T = 4.2K, a_0 is shown to increase monotonically. For $In_{0.35}Ga_{0.65}Sb$, thermal power due to phonon drag a_{ph} is derived and its dependence on temperature, $\alpha_{ph}(T)$, is plotted. It is shown that when α_{ph} rises with decreasing T, $\alpha_{ph}(T)$ changes as $T^{-2.6}$; and when the curve falls, it is characterized by a power index of 2.8. These results for $In_{0.35}Ga_{0.65}Sb$ compare reasonably well to other semiconductors for solid solutions and are in good agreement with Herring theory.

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