

Abstract Submitted
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Enhancement of Thermoelectric Performance of Lead Chalcogenides: PbTe, PbSe and PbS, Due To Temperature Dependent Light and Heavy Hole Valence Band Convergence.¹ KAPILA WIJAYARATNE, J. ZHAO, Univ of Virginia, C. MALLIAKAS, Northwestern Univ, U. CHATTERJEE, Univ of Virginia — Among many other interesting properties, Lead Chalcogenides are known for their remarkable thermoelectric performance. We have conducted temperature dependent Angle Resolved Photoemission Spectroscopy (ARPES) study of the electronic structures of Lead Chalcogenides, PbTe, PbSe and PbS. Our observations provide direct evidence for the existence of light-hole upper valence bands and so far undetected heavy-hole lower valence bands in these materials. An unusual temperature dependent relative movement between these bands was detected. This movement leads to a monotonic decrease in the energy separation between their maxima with the increase of temperature. This phenomenon is referred to as band convergence and is believed to be the driving factor behind extraordinary thermoelectric performances of Lead Chalcogenides at elevated temperatures.

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