High Powerfactor in single and few-layer MoS2 YING WANG, YU YE, KEDAR HIPPALGAONKAR, YUAN WANG, XIANG ZHANG, University of California, Berkeley — The thermoelectric effect enables conversion between thermal and electrical energy, and provides one way to extract energy from waste heat. The efficiency of a thermoelectric device can be defined by a dimensionless figure of merit given by $ZT = S^2\sigma T/\kappa$. In order to achieve efficient thermoelectric devices, $S^2\sigma$ needs to be kept high by optimizing the interplay between the $S$ and $\sigma$. The thin layered transition-metal dichalcogenide semiconductor MoS2 has attracted great interest because of two dimensional density of states and relatively high mobility, which could give a large $S$ and $\sigma$. Here we study on pristine exfoliated 1L-, 2L- and 3L MoS2 samples by simultaneous measurement of the Seebeck coefficient ($S$) and two probe electrical conductivity using nano-fabricated heater and thermometer. It firstly shows that atomic thin MoS2 which has a large effective band masses ($m*$) as well as high mobilities ($\mu$), increases the powerfactor $S^2\sigma$ to as high as $8.5 \text{mWm}^{-1}\text{K}^{-2}$ at room temperature (twice as high as commercially used Bi$_2$Te$_3$). Further, we show for the first time that the confined two-dimensional density of states of the conduction band can be studied in monolayer MoS2 by measuring the gate-dependent Seebeck voltage.