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Effect of various inorganic films on the growth of $CsSnI_3$ crystal towards thermoelectric applications

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Halide perovskites have found potentially inexpensive fabrication technology with ultralow thermal conductivity. Among them, inorganic tin halide perovskite ($CsSnI_3$) developed as a potential thermoelectric film in recent past years owing to high electrical conductivity and decent Seebeck coefficient. Their electronic properties are determined from corner sharing flexible SnI_6 octahedra. The commonly observed trade-off among thermoelectric parameters ($ZT=\sigma S^2/k$; ZT=figure of merit; σ =electrical conductivity, S=Seebeck coefficients and k is thermal conductivity) can be overrule in a nanocomposite grown perovskite nanocrystal. Here in, solution processed $CsSnI_3$ crystal growth are observed in presence of various porous scaffolds TiO_2, Al_2O_3 and ZrO_2 for thermoelectric purposes.

The equimolar mixture of ($CsI+SnI_2$) precursor solution was spin coated over the inorganic porous layer followed with baking at moderate low temperature 130 ℃/20 min to growth the crystal in nanocomposite $CsSnI_3/TiO_2$, $CsSnI_3/Al_2O_3$ and, $CsSnI_3/ZrO_2$.

X-ray diffraction (XRD) pattern of grown $CsSnI_3$ crystal over the mesoporous films TiO_2, Al_2O_3, and ZrO_2 show a dominant shift. This shift in bragg peak shows the interaction among perovskite ink and inorganic nanoparticles of porous film. The resulting thermoelectric performance evaluation and characterizations would be discussed in detail in the conference.