Abstract
Satisfying the ever-increasing demand for electricity while maintaining sustainability and eco-friendliness has become a key challenge for humanity. Around 70% of energy is rejected as heat from different sectors. Thermoelectric energy harvesting has immense potential to convert this heat into electricity in an environmentally friendly manner. However, low efficiency and high manufacturing costs inhibit the widespread application of thermoelectric devices. In our work, we utilize an inexpensive solution processing technique and nanostructuring approach to create thermoelectric materials. Specifically, we characterize the solution-state and solid-state structure of the PbSe precursor, which has shown promise for preparing thermoelectric PbSexTe1-x thin film. The precursor was prepared by reacting lead and diphenyl diselenide in different solvents. The characterization reveals the formation of solvated lead(II) phenylselenolate complex which deepens our understanding of the formation of these precursors. We also synthesize a low-temperature SnSe precursor and identify it as tin(IV) methylselenolate. The low transformation temperature makes it compatible with colloidal PbSe nanocrystals. The colloidal PbSe nanocrystals were chemically treated with tin(IV) methylselenolate and subjected to mild annealing to form conductive nanocomposites. Finally, I will be presenting our ongoing efforts at developing the setup for temperature-dependent thermoelectric property measurements and our attempt at characterizing PbSexTe1-x thin films.