Colloidal Synthesis of PbTe and SnSe for Thermoelectric Application

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The escalating demand for alternative clean energy sources requires the development of new and effective materials for energy recovery and conversion. Thermoelectrics (TEs) appear as a promising technology for global energy transition. When integrated into a real device, the best bulk TE materials have $zT \approx 1.2$, but an average $zT = 2–4$ is necessary for TE energy conversion. Fortunately, it has been shown that creating nanostructured composite devices in new geometries can increase TE efficiency. Also the preparation of TE materials trough solution-based methods offers a promising path towards minimizing the TEs production cost. We investigated colloidal synthesis of the phase-pure PbTe and SnSe nanomaterials, since they are promising TE materials with $zT_{max} > 2.4$. This particles where obtained by a large-scale synthesis similar as we previously reported [1]. The PbTe and SnSe materials where characterized by scanning electron microscopy (SEM) revealing an interesting shape and size of the resultant particles as observed on Figure 1. Further TE characteristics of spark-plasma-sintered PbTe and SnSe, namely, thermal conductivity, electrical resistivity, Seebeck coefficient and zT, have also been investigated and discussed.

REFERENCES

[1] V. Sousa, B. F. Gonçalves, M. Franco, Y. Ziouani, N. González-Ballesteros, M. F. Cerqueira, V. Yannello, K. Kovnir, O. I. Lebedev, Y. V. Kolen'ko, Chem. Mater., 31 (2019), 260–267.

FIGURES

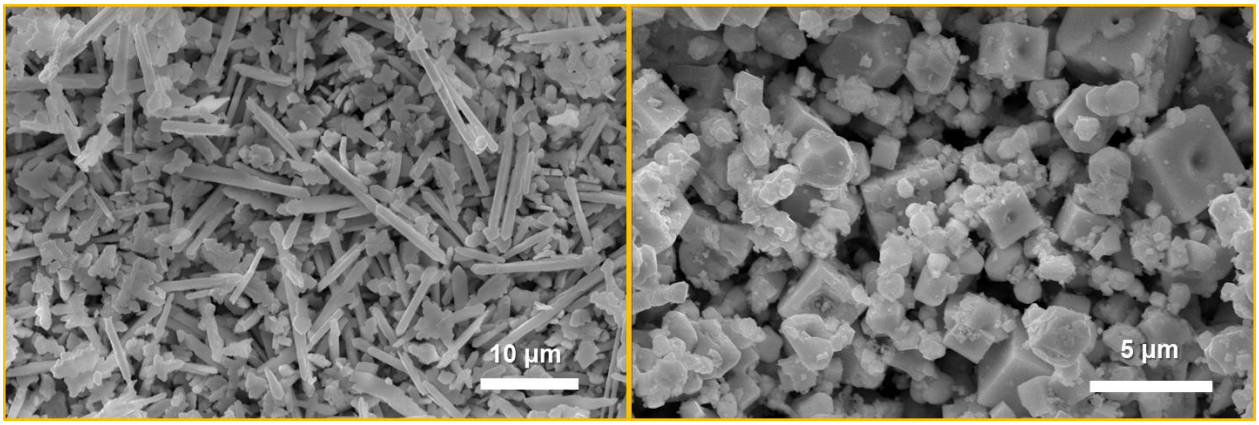

Figure 1: Scanning electron microscopy images of SnSe (on the left) and PbTe synthesized particles (on the right).