

Solution-Processed PbTe Thermoelectrics with Enhanced Performance via Post-Synthetic Modification

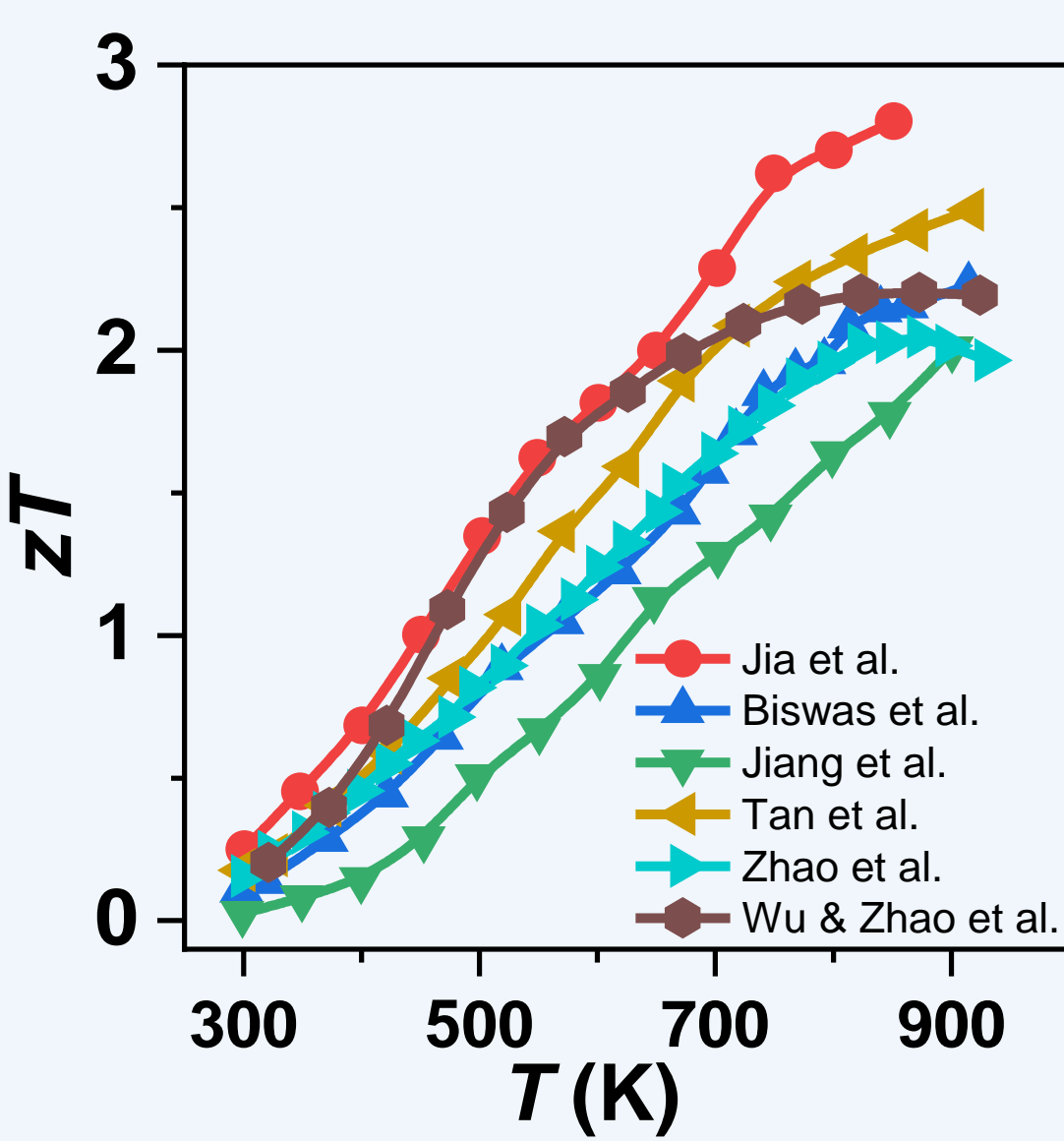
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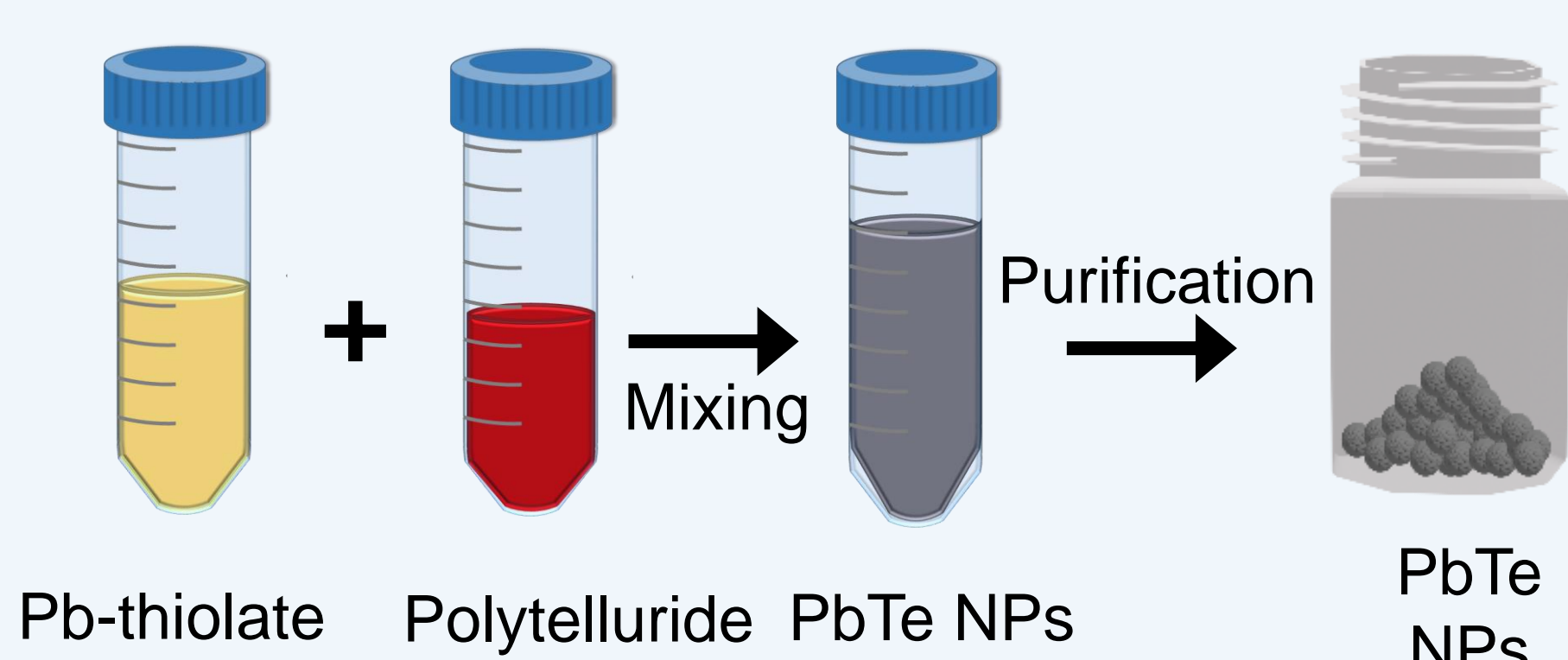
1. Motivation



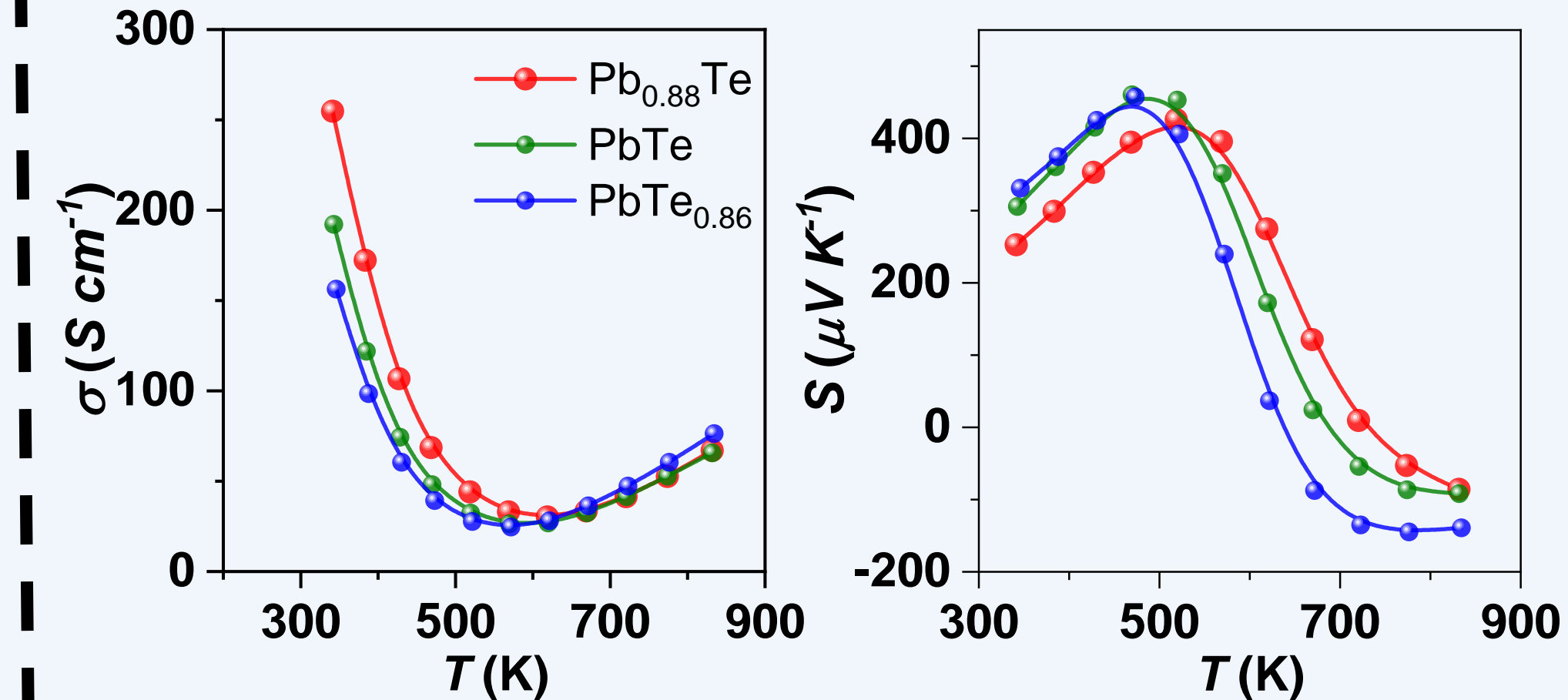
PbTe's implementation is limited by costly, energy-intensive synthesis methods despite excellent performance

Goal: Develop cost-effective, scalable production methods without compromising performance

2. Cost-effective Synthesis Method

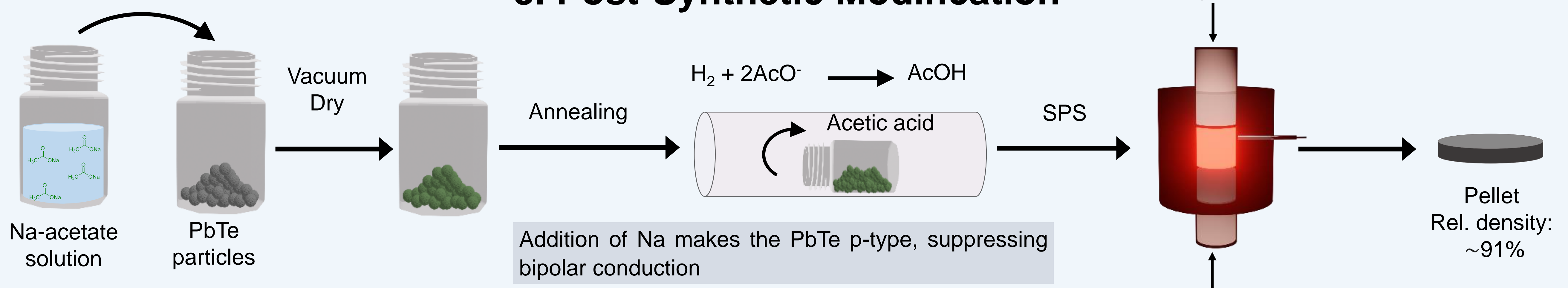


Mixing lead thiolates with polytellurides yields stoichiometric PbTe particles instantly, with excess precursors remaining in solution for easy purification



Due to PbTe's bipolar nature, off-stoichiometric conditions were attempted to tune the material to either p- or n-type conduction.

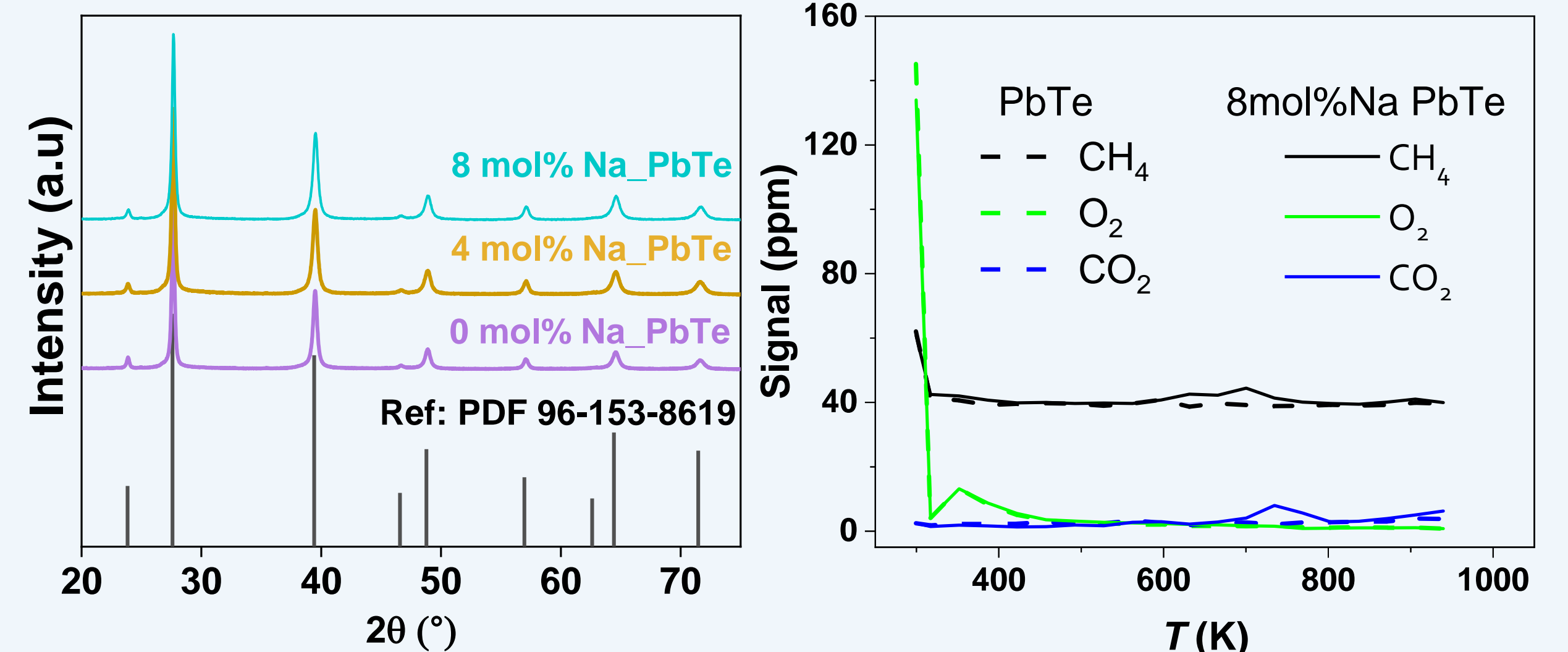
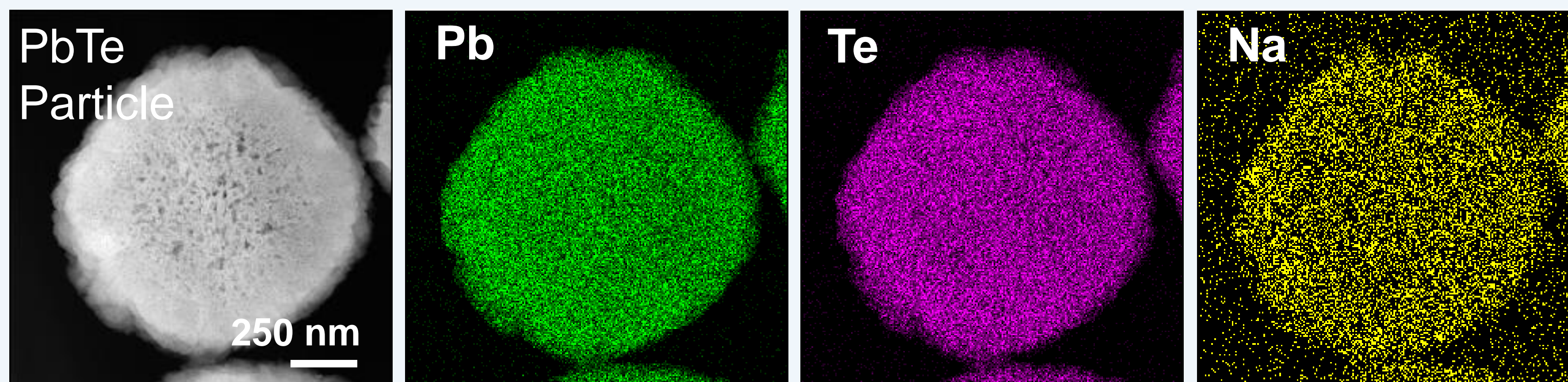
3. Post-Synthetic Modification



Addition of Na makes the PbTe p-type, suppressing bipolar conduction

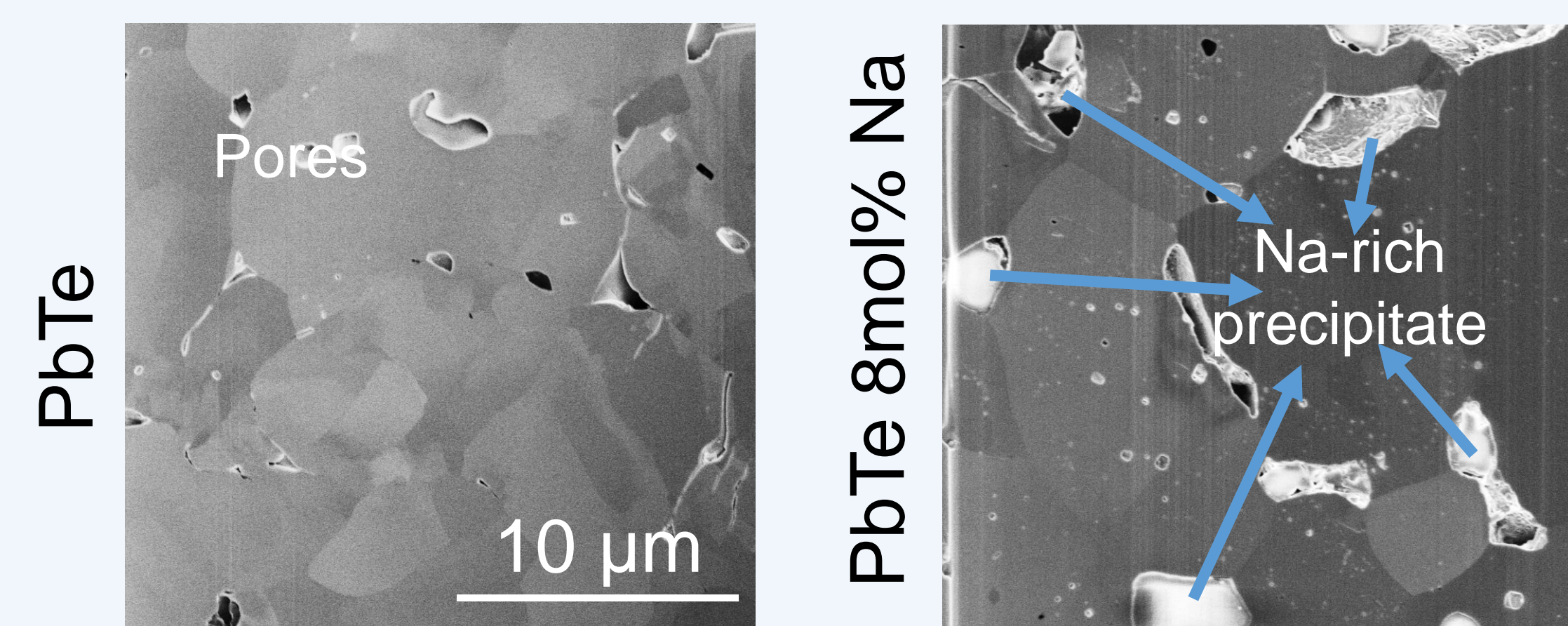
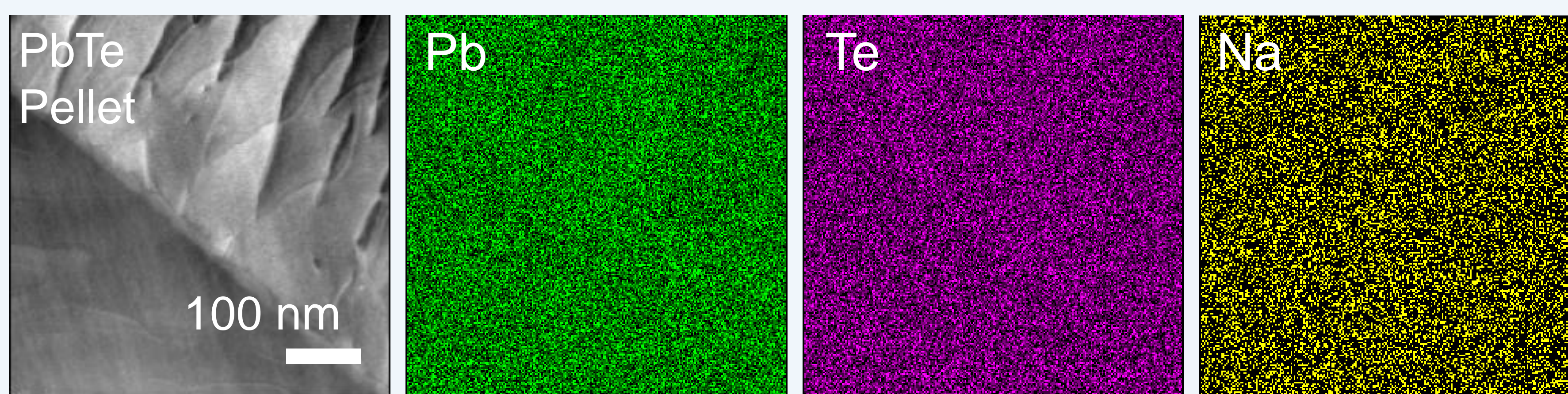
4. Morphological and Structural Characterization

SEM images coupled with EDX of the cross section the PbTe particle before annealing



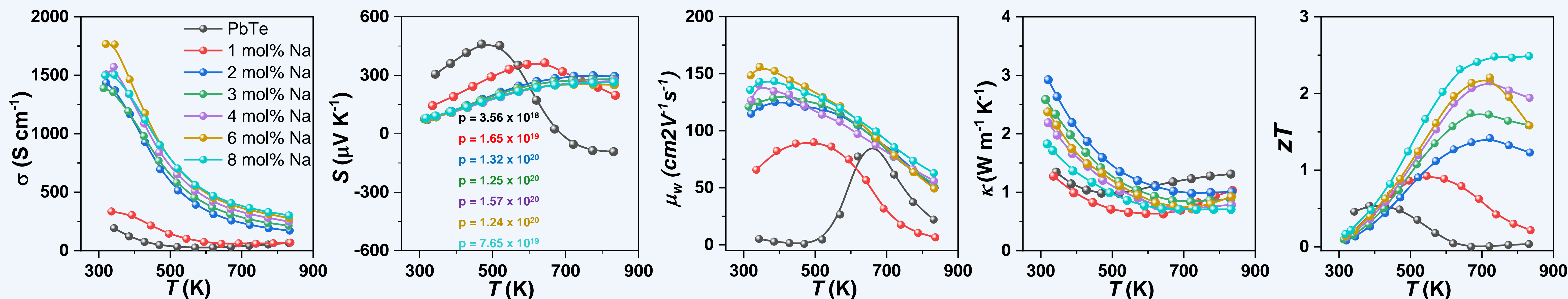
Nations infiltrate and get trapped in the hollow PbTe particles

TGA-MS shows the release of organic and volatile species during annealing, forming porous microstructure



Na-rich precipitates coupled with the pores, significantly reduce the thermal conductivity

5. Transport Properties



6. Concluding Remarks

- We developed a cost-effective and scalable protocol for synthesizing high-performing PbTe with comparable performance to state-of-the-art
- As a result of excess Na, we form nanoprecipitates that act as scattering centers for phonons resulting in a low thermal conductivity

