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The microstructure network and thermoelectric properties of bulk (Bi,Sb)₂Te₃ HYE JUNG KANG, Clemson University, WENJIE XIE, Clemson University, Wuhan University of Technology, DALE HITCHCOCK, JIAN HE, Clemson University, XINFENG TANG, Wuhan University of Technology, MARK LAVER, Technical University of Denmark, University of Copenhagen, Paul Scherrer Institut, BOUALEM HAMMOUDA, National Institute of Standards and Technology — We report small-angle neutron scattering studies on the microstructure network in bulk (Bi,Sb)₂Te₃ synthesized by the melt-spinning (MS) and the spark-plasma-sintering (SPS) process. We find that rough interfaces of multiscale microstructures generated by the MS are responsible for the large reduction of both lattice thermal conductivity and electrical conductivity. Our study also finds that subsequent SPS forms a microstructure network of 10 nanometer thick lamellae and smooth interfaces between them. This nanoscale microstructure network with smooth interfaces increases electrical conductivity while keeping a low thermal conductivity, making it an ideal microstructure for high thermoelectric efficiency.

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