

Supplementary Information

In-situ transmission electron microscopy (TEM) study on the structural evolution behavior of nano Sn sheets under thermal field

Xia Zhou¹, Junwei Zhang¹, Hongli Li⁴, Cong Ma¹, Yiqun Zhao¹, Hong Zhang^{2,3,1*} and Yong

Peng^{1*}

1.School of Materials and Energy, or Electron Microscopy Centre of Lanzhou University, Lanzhou University, Lanzhou 730000, PR China

2. Yunnan Key Laboratory of Electromagnetic Materials and Devices, National Center for International Research on Photoelectric and Energy Materials, School of Materials and Energy, Yunnan University, Kunming, 650091, China

3. Electron Microscopy Center, Yunnan University, Kunming, 650091, China

4. Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences, Lanzhou 730000, PR China

*Corresponding authors: hongzhang@lzu.edu.cn or pengy@lzu.edu.cn

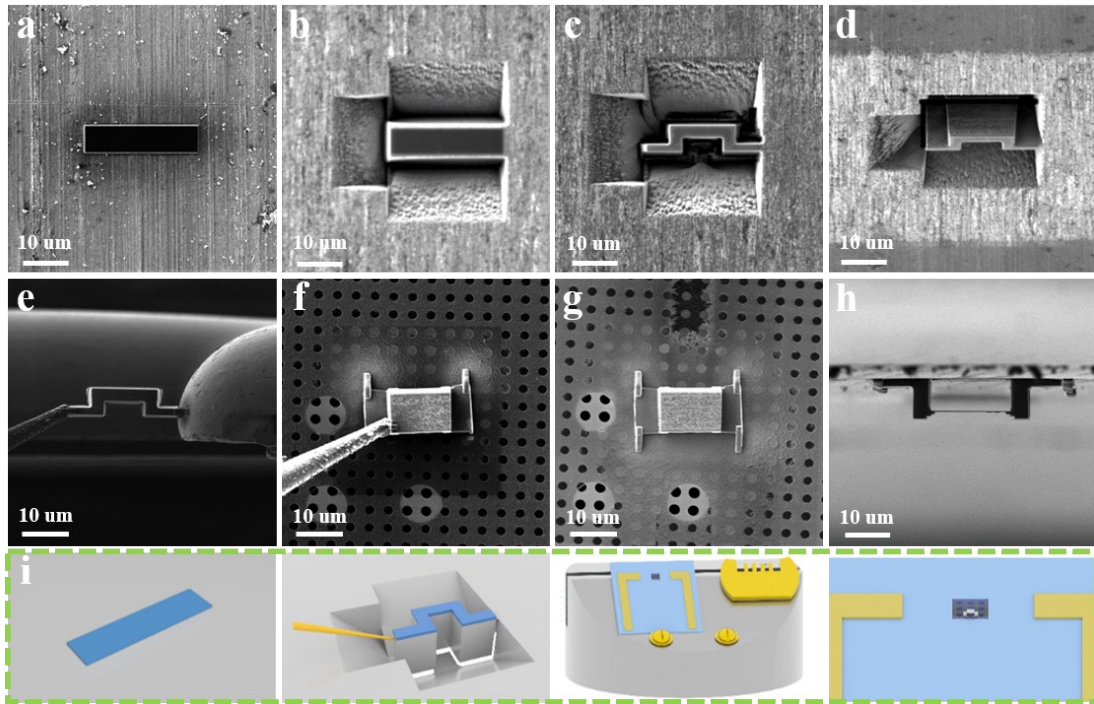


Fig. S1. Series of SEM images showing the in-situ TEM sample produced by the **FIB**. (a) Pt protection layer. (b) Trenches were milled on both sides of the Pt protection layer. (c-e) Polish the observation region and transfer the sample to the Grid with a tungsten tip. (f-g) The refined sample is transferred to the heating chip and fixed with Pt. (h) Thin visible region and low voltage clear. (i) Schematic illustration of the sample preparation process.

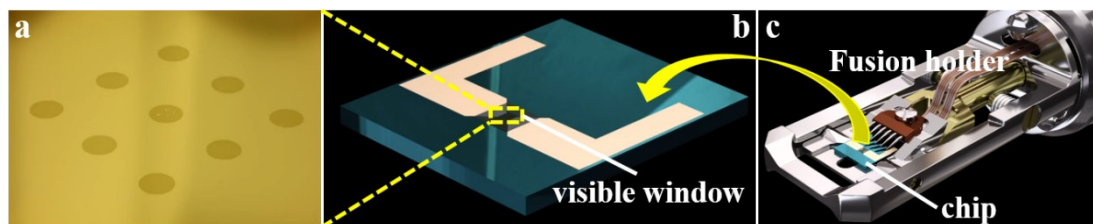


Fig. S2. Schematic diagram of the fusion holder and E-chip. (a)The observation region of heating chip. (b) Schematic illustration of the heating chip. (c) Schematic diagram of the front end of the fusion holder.

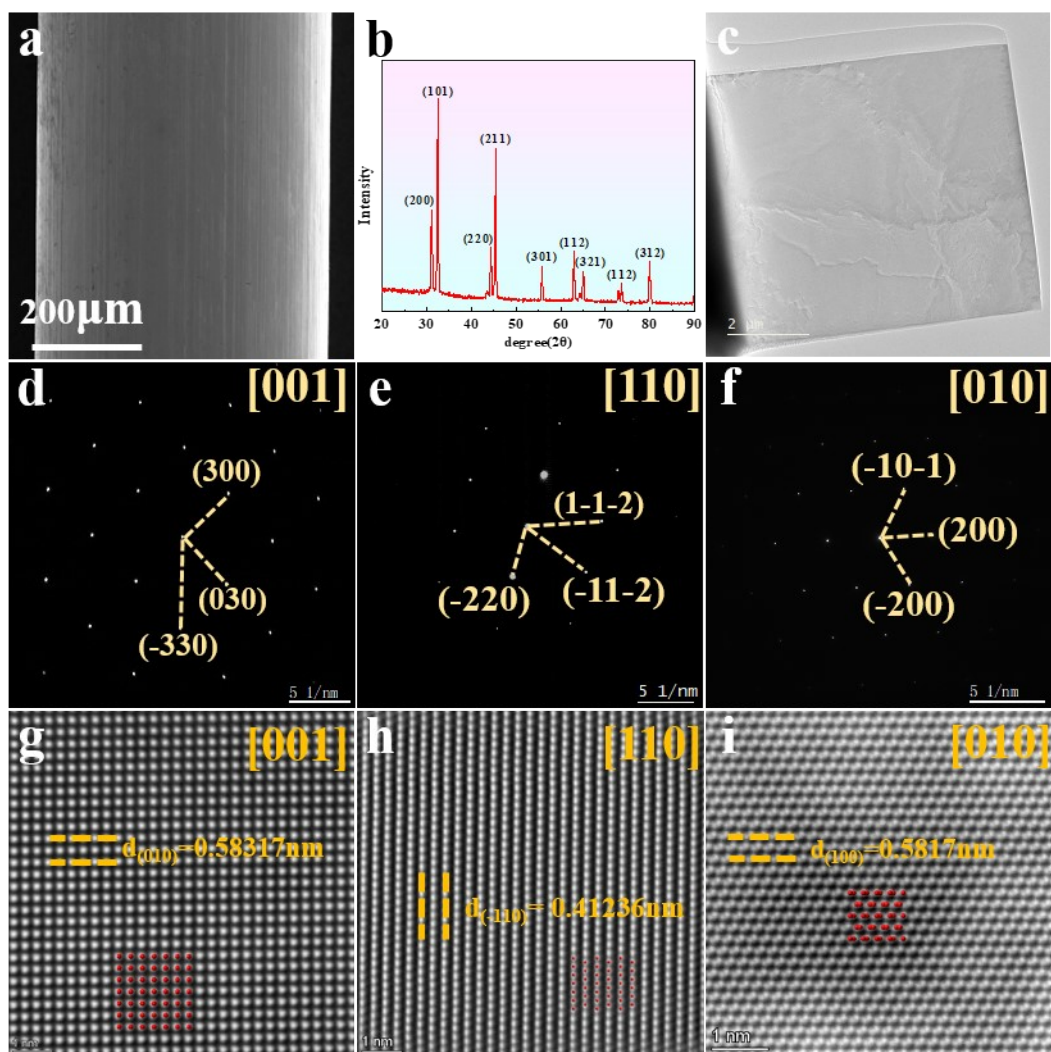


Fig. S3. Identification of the initial sample. (a) The morphology of macroscopic bulk sample. (b) The XRD information of the bulk sample. (c) The TEM sample produced by the FIB. (d-f) Diffraction information with three different axes. (g-h) Atomic HAADF-STEM images of the sample with three different axes.

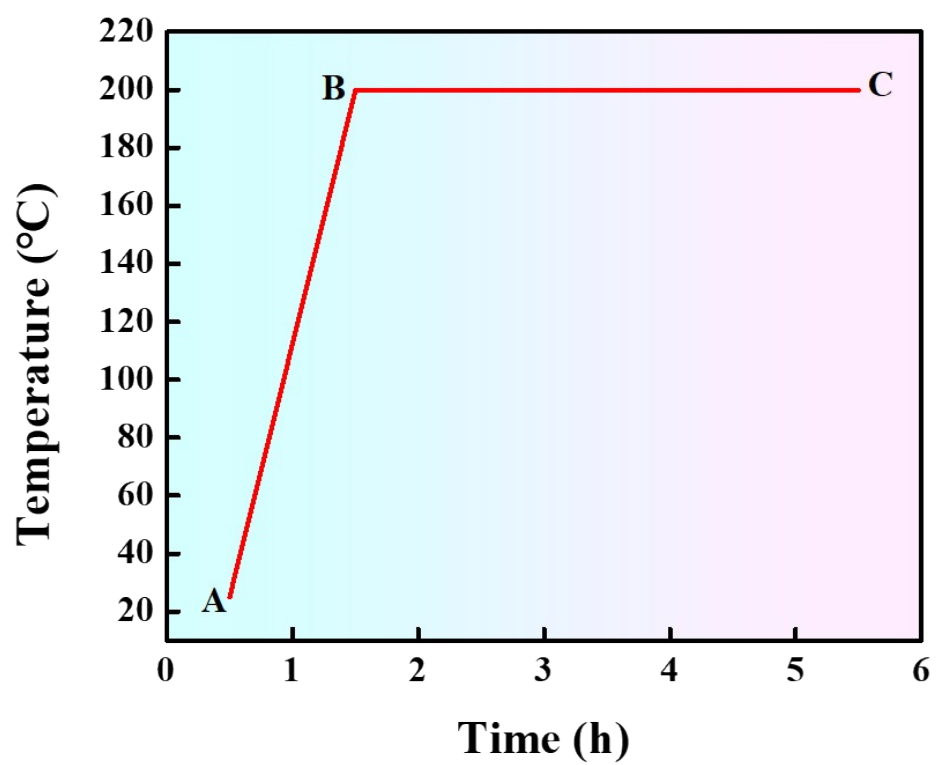


Fig. S4. Temperature curve of the slow heating process of nanometer Sn sheet.

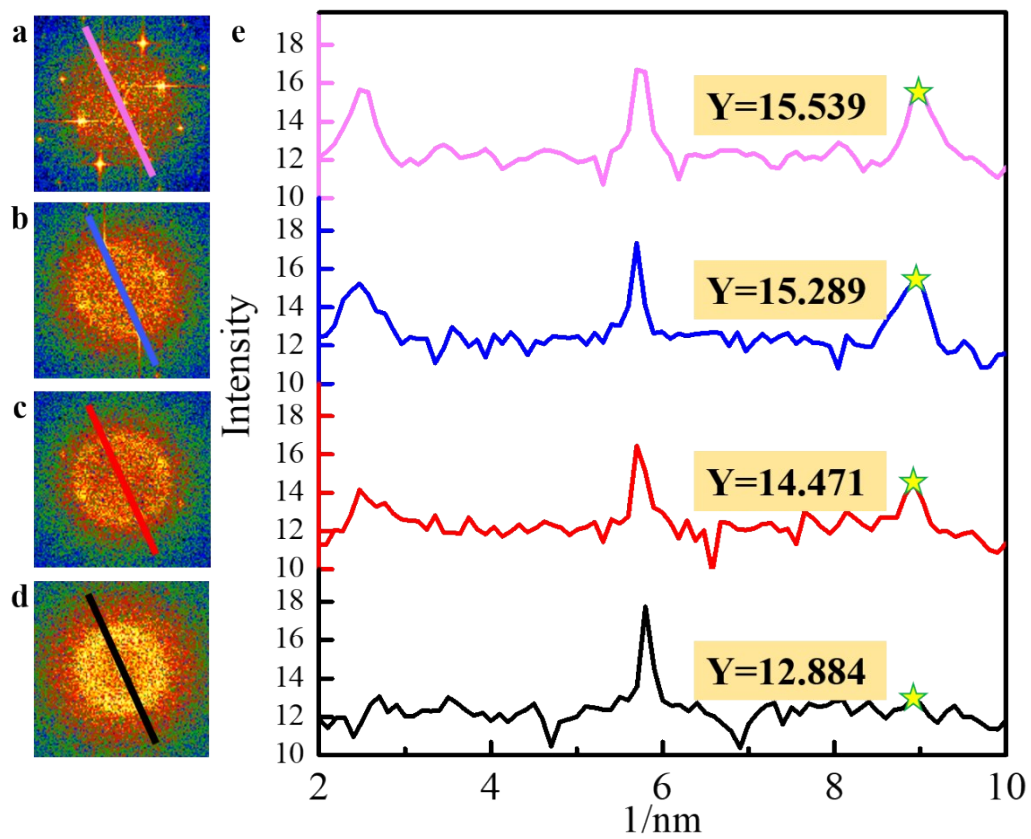


Fig. S5. Comparison of the intensity of the diffraction points during crystallization.

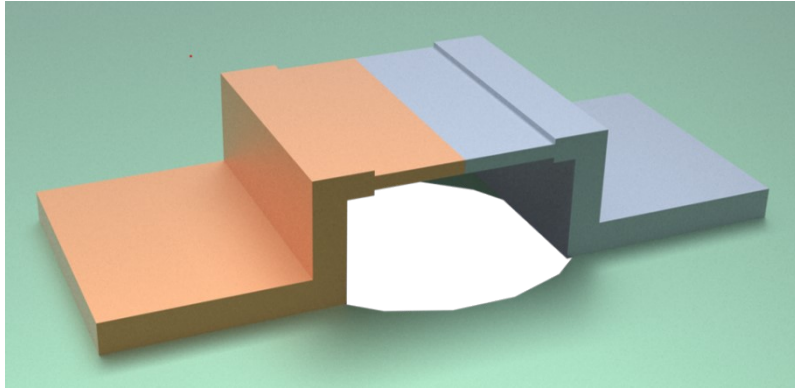


Fig. S6. Sample preparation simulation diagram of Sn sheet and Cu of nanometer solder.

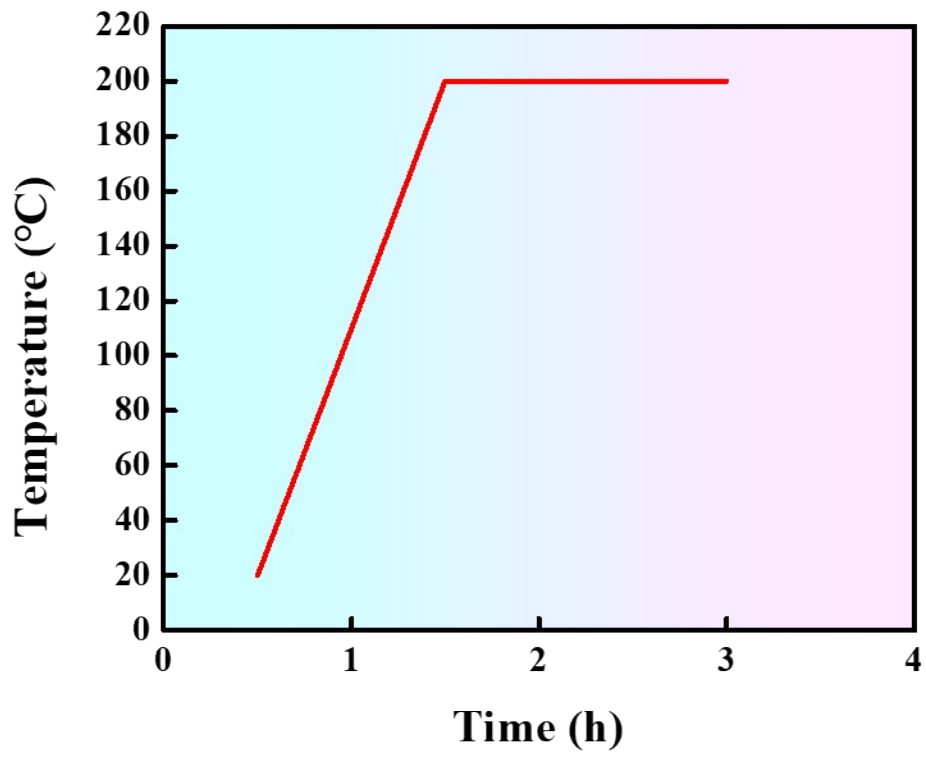


Fig. S7. Temperature curve of Sn-Cu interface sample heating experiment.

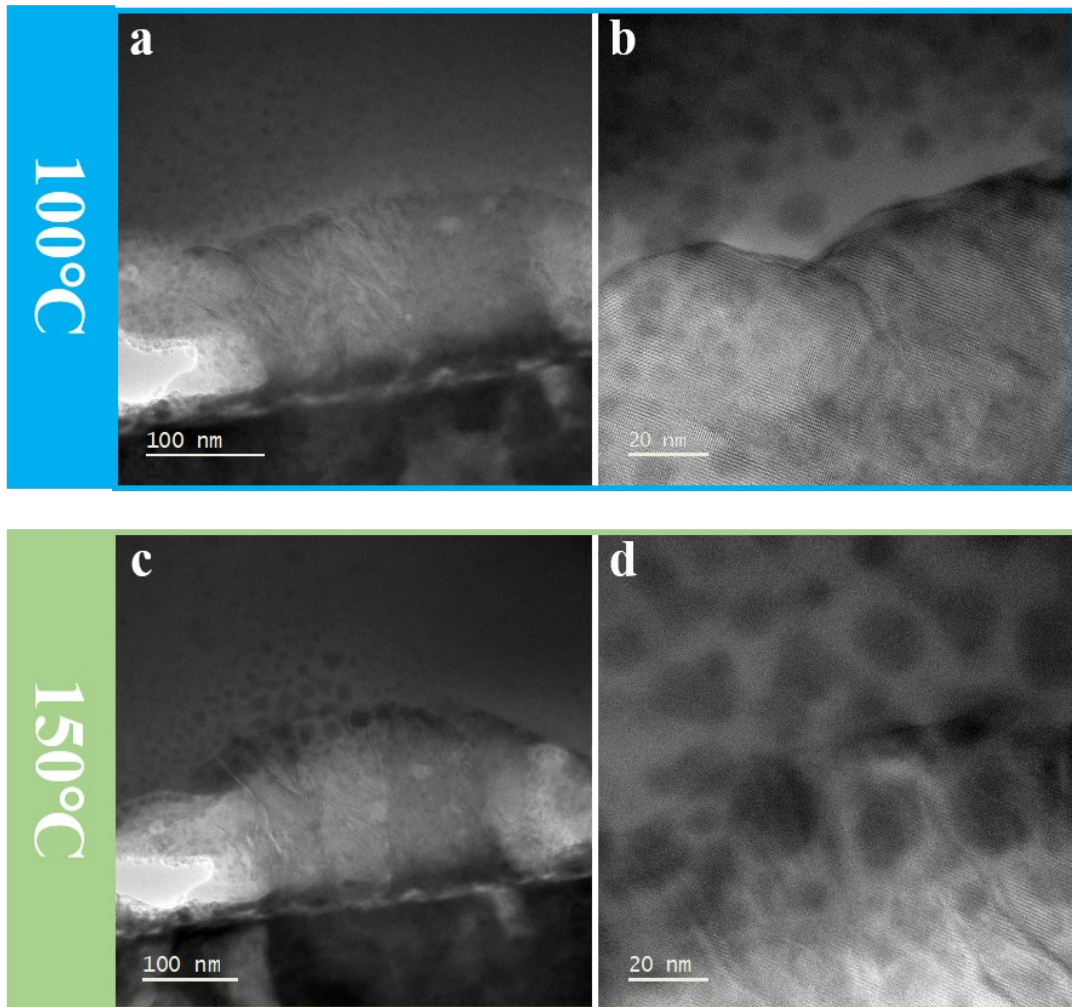


Fig. S8. TEM images of welding process between Sn sheet and Cu of nanometer solder.

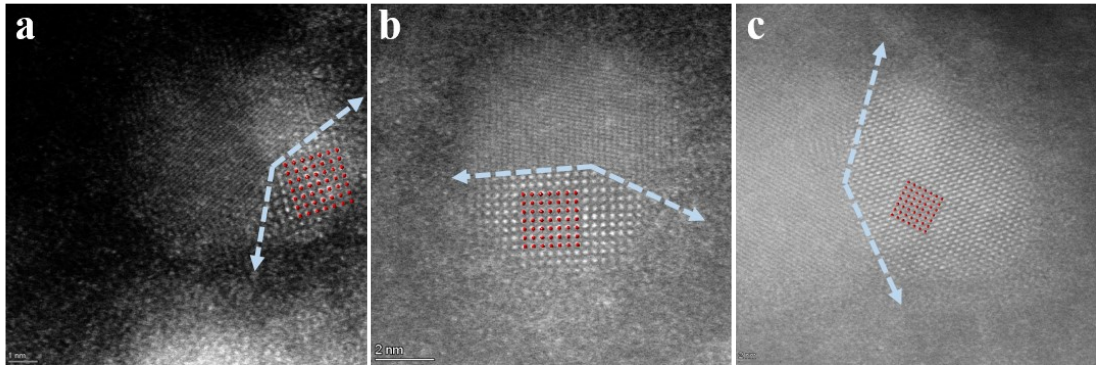


Fig. S9. HAADF-STEM images of nanoparticles in Fig. 5e.