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Study on Microstructure and Properties of Micron Copper Powder-Liquid Metal Gallium Composite Interconnect Joint

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Supplementary Materials

Figure S1 displays the elemental mapping results for Cu/Ga across selected regions within Figure 3.

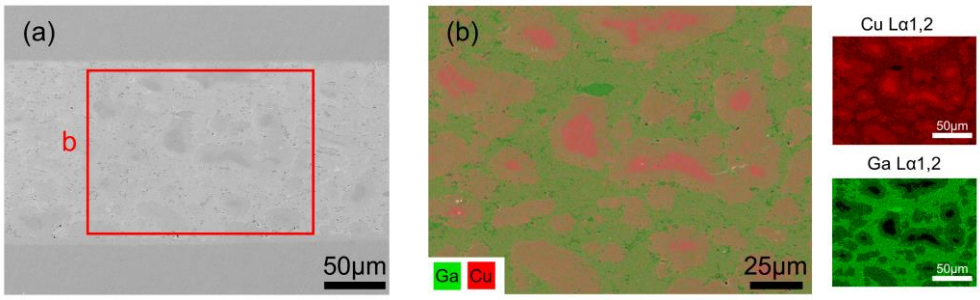


Figure S1. (a) SEM images of the joint prepared using a Cu-Ga paste (Cu_{PS} = 30-40 μm, Cu_{MF} = 25 wt%) after reaction at 220 °C and 5 MPa for 12 h; (b) Cu/Ga elemental maps of rectangle b in (a).

Figure S2 presents SEM micrographs of joints at 400× magnification under different Cu powder particle sizes (Cu_{PS}) and Cu mass fractions (Cu_{MF}) (Figure 4 in the main text corresponds to locally enlarged regions of Figure S2). These images provide a more comprehensive understanding of the overall morphology of the joints. It can be observed that the interfacial structure primarily consists of the Cu substrates on both sides and a Cu–Ga interconnected structure in the middle. Due to the highly compact microstructure in certain regions, only selected images are annotated accordingly.

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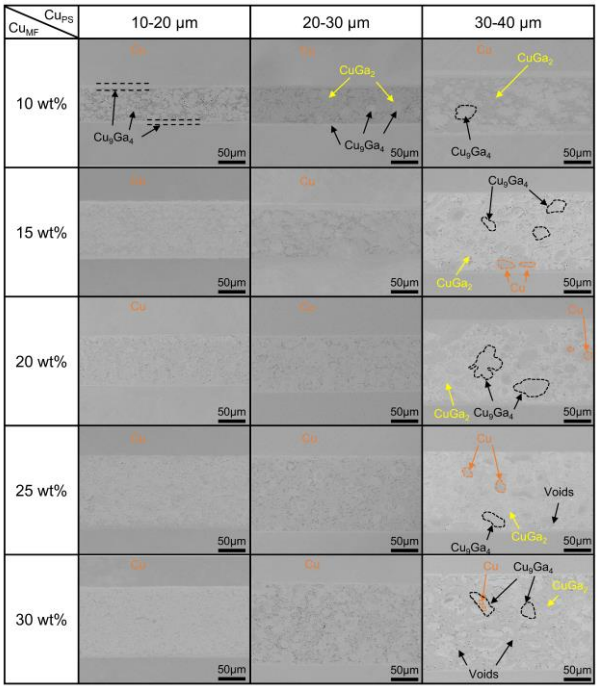


Figure S2. SEM image of a sandwich joint with different Cu_{PS} and Cu_{MF} at 400× magnification after reacting at 220 °C for 12 hours.

Figure S3 presents SEM images of interfacial microstructure of joints under various TLPB conditions (the images in Figure 7 of the main text are locally magnified regions of Figure S3). These images provide a more comprehensive understanding of the overall morphology of the joints.

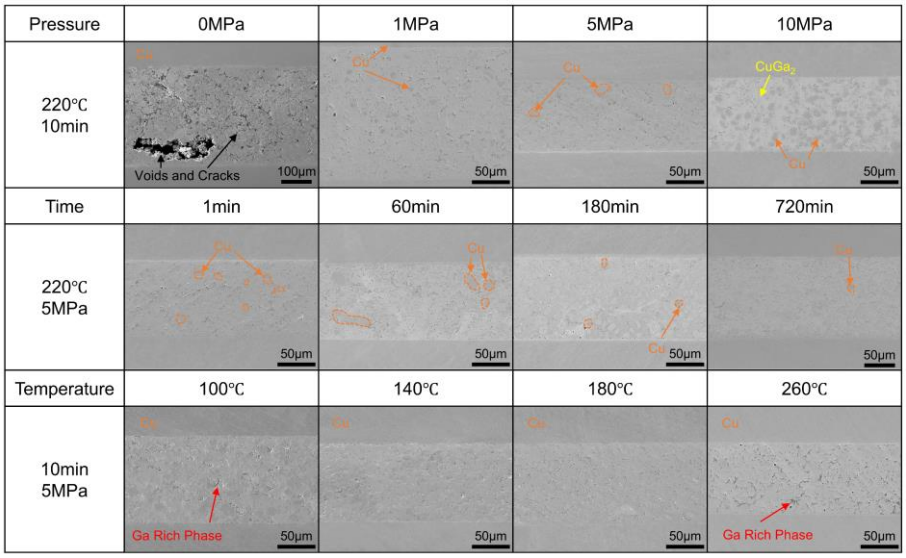


Figure S3. Microstructural interfaces of joints under different pressure, time, and temperature conditions.