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Overview of in-situ synchrotron X-ray imaging and powder diffraction techniques for Pb-free micro-electronic interconnects

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The development of reliable advanced micro-electronic interconnects that are free of toxic materials such as lead depends on an in-depth understanding of the microstructures that exist in individual solder joints. This research combines the synchrotron techniques of in-situ imaging and powder diffraction (PD) to give an understanding of the development and stability of these microstructures. This presentation provides an overview these challenging techniques and provides key findings related to understanding the reliability of Pb-free solder joints. The following two advanced experimental approaches will be discussed, (1) Synchrotron X-ray imaging at SPring-8 synchrotron BL20B2 and BL20XU, (2) synchrotron PD at the Australian Synchrotron PD. This research has been conducted with support from the Australian Synchrotron (beamtime and international access grant IDs: AS101/PD/2249, AS112/PD/3712, AS113/PDFI/4113, AS/IA114/4743, AS121/PD/4524, AS122/PD/4903, AS123/PD/5327, AS/IA124/6235, AS131/PD/5784, AS142/PD/7943, AS/IA143/9218, AS/IA151/9538, AS161/PD/10430, AS/IA163/11874), SPring-8 synchrotron (beamtime IDs: 2009A1159, 2011B1048, 2012A1192, 2014B1620, 2015A1675, 2016B1319, 2017B1519) and an international cooperative research program between the University of Queensland and Kyushu University (Progress 100 project), Kyoto University, Imperial College London, UniMAP, Nihon Superior Co, with additional support from The Australian Research Council.

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