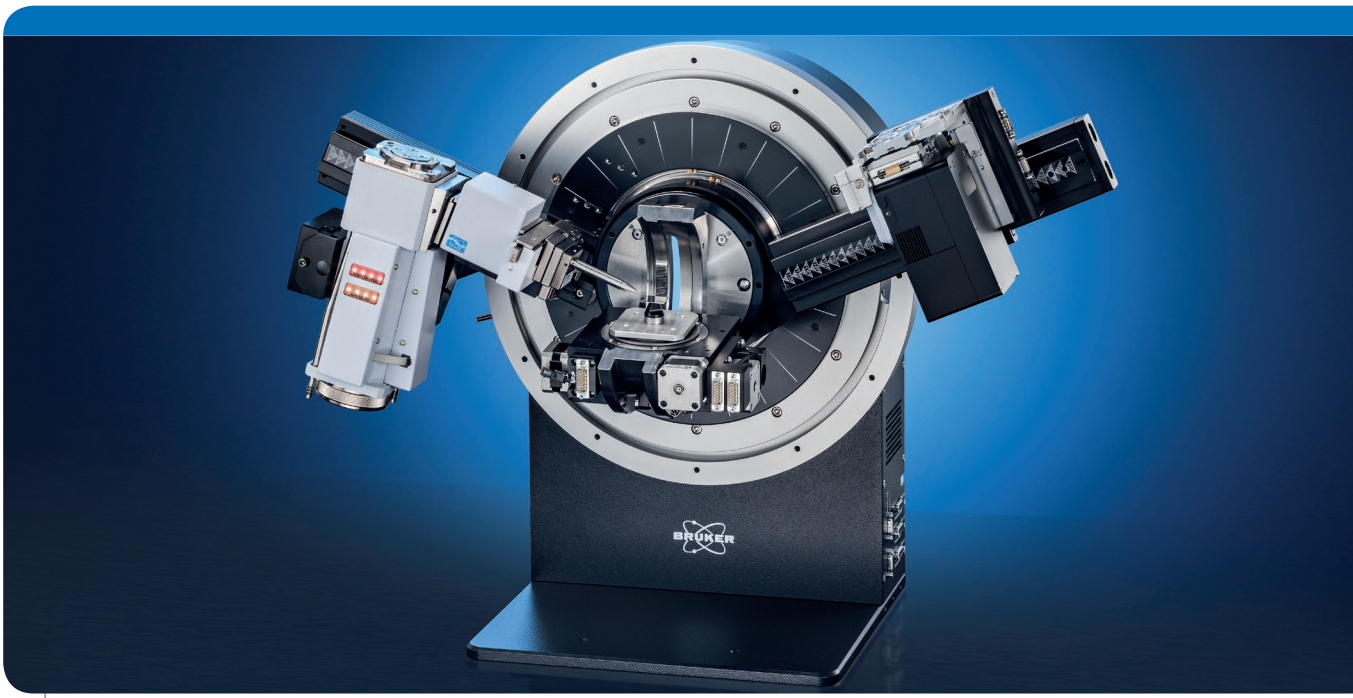

Application Report XRD 30

D8 Family - Microdiffraction

- μ-XRD^2 on a Soldered Joint

The D8 ADVANCE and D8 DISCOVER are true multipurpose solutions offering unmatched analytical performance with unrivaled ease-of-use for all XRD applications. The seamless integration of the outstanding EIGER2 R 500K detector perfectly fits to the DaVinci design and extends once more the analytical capabilities of the instruments.

This application note describes a microdiffraction measurement of a soldered joint on an electronic board using a D8 multipurpose diffractometer equipped with MONTEL mirror and EIGER2 detector.

Diffraction experiments performed on small areas often result in poor particle statistics due to the large crystallite size relative to the probed area. A detector with a large angular γ-coverage is essential to minimize the risk of missing diffraction signal. The ability to use the EIGER2 detector in γ-optimized mode ensures maximum diffracted beam capture.

The EIGER2 was placed at a short sample-to-detector distance of 154 mm to maximize the angular γ-coverage, while the 75 μm pixel size maintains proper angular resolution. The MONTEL mirror primary beam optics provides monochro-

matic radiation, and conditions the X-ray beam divergence in both equatorial and axial directions, providing excellent control of the X-ray beam footprint.
Further refinement of the X-ray beam size is achieved with a 1 mm UBC collimator.

The electronic board was placed directly on the compact UMC stage, precise and contact-free sample positioning was performed with the Laser-Video microscope, shown in Figure 1. Selecting the point of interest on the sample is a single click operation, with the measurement software taking care of the correct sample positioning in X, Y and Z.

Figure 2 shows the 2D data collected on soldered joint X6 from 9° to 87° 2Θ with total measurement time of 7 minutes. The 2D data shows several phases with distinct morphology including bright spots due to the large crystallite size of the identified Sn phase and more uniform rings associated with smaller grains in the Ag_3Sn phase.

Figure 2 also shows the integrated data and corresponding phase identification with DIFFRAC.EVA. The identified phases correspond to those expected in lead-free SAC (Sn-Ag-Cu) solders.
Deviation from the theoretical random powder pattern relative intensities is due to the limited number of crystallites in the diffracting condition.

The example clearly demonstrates that a multipurpose D8 instruments equipped with EIGER2 detector and DIFFRAC.EVA represents a complete solution for microdiffraction .

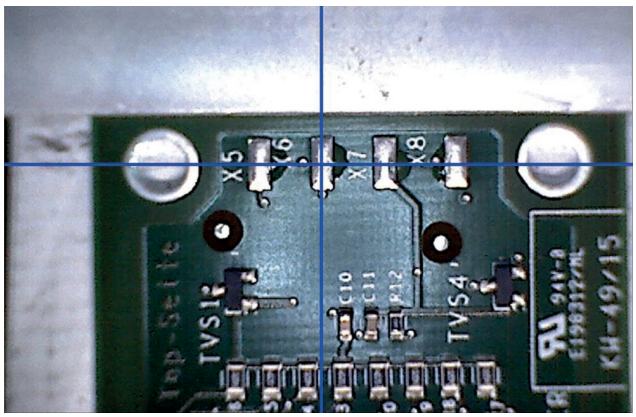

Figure 1: Image taken with the Laser-Video microscope. The cross-hair indicates the measurement position at solder bond X6.

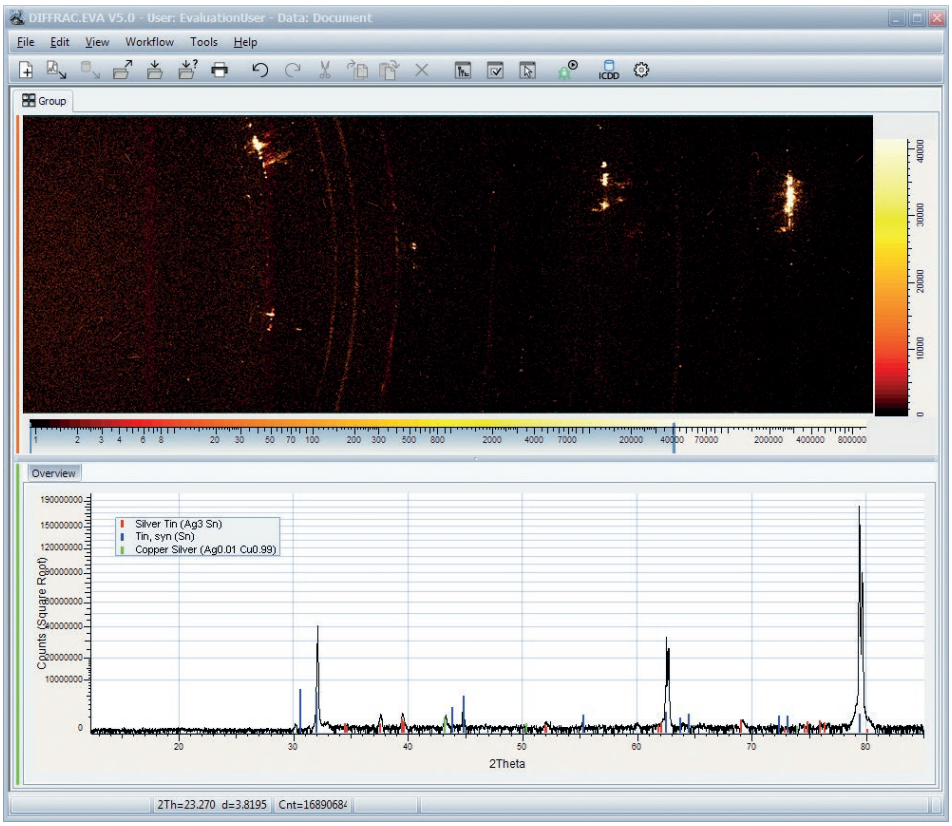

Figure 2:
2D data set measured at soldered joint X6.
Integrated diffraction pattern and phase identification with DIFFRAC.EVA, using the COD database.
Note that the intensity is displayed in square root in order to better see the small diffraction peaks from the minor phases.

Bruker AXS GmbH

info.baxs@bruker.com

Worldwide offices

bruker.com/baxs-offices