ESRF	**Experiment title:** In situ investigation of dislocation-grain boundary interaction in Cu + 6wt% Al	**Experiment number**: MA2096
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Report:

Aim of this experiment was to study the grain-boundary dislocation interaction mechanisms. For this purpose, 9 macro samples with one large angle grain boundary and 4 reference single crystals each had been produced in our home lab. The large angle grain boundary exhibited a high transmission probability, i.e. a high transmission factor and low inclination of two transmitting slip planes. The samples were strained in displacement controlled mode with our second generation of the micro-straining devices as shown in Figure 1. Force, displacement and Laue images were recorded simultaneously.

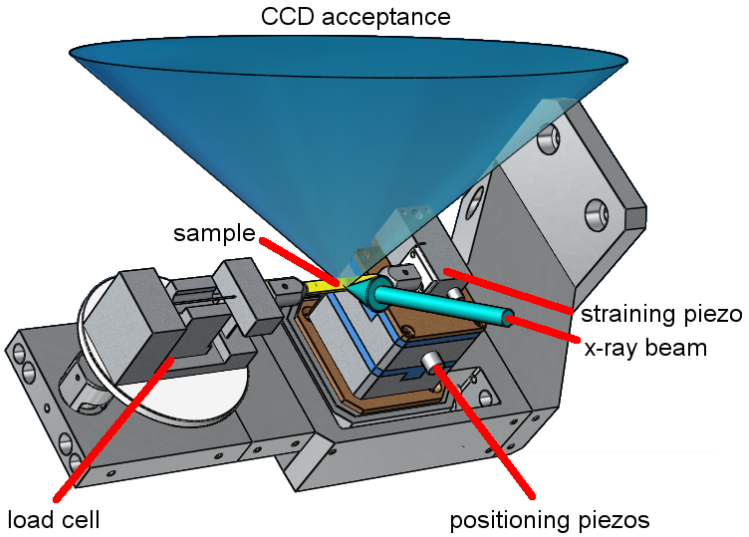

Figure 1 The second generation of our synchrotron straining device (SSD) [1]

The mechanical response of the sample is currently correlated with the evolving GND densities analyzed by Laue diffraction.

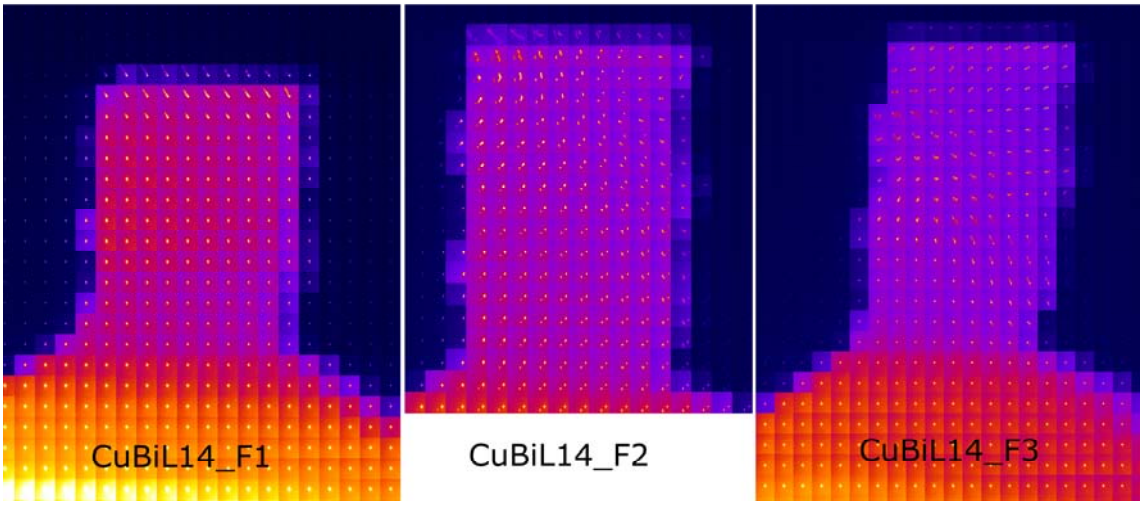

Figure 2 Composite image representing one Laue spot at various positions in the micro compression pillar. The fluorescence causing significant background in the CCD allows for reconstructing the geometry of the compression sample in this composite image. The left and right pillar are the single crystalline references behaving like presented in [2]; the centered one shows a bicrystalline pillar.

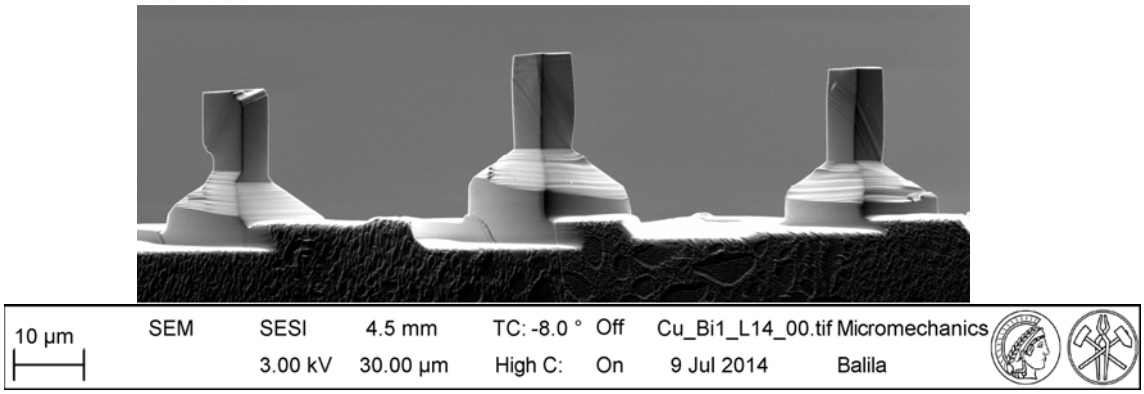

Fig. 3 Scanning electron micrograph of the deformed samples. The centered pillar contains a grain-boundary where dislocations transmitted from one in a other grain.

We expect the publication of the data in a high raked material science magazine within the next two years. Furthermore, the experiments are the base of the PhD of Nataliya Malyar. During the last night we were able to measure 7x7x21µm³ sized tin samples as a model material for lead free solder joints. The measurements demonstrate the possibility of using Laue diffraction to unravel the deformation behaviour in tetragonal metals.

Literatur:

[1] C. Kirchlechner, J. Keckes, J.S. Micha, G. Dehm. In situ µLaue: Instrumental setup for the deformation of micron sized sample, Advanced Engineering Materials 13 (2011) 837-844.

[2] C. Kirchlechner, J. Keckes, C. Motz, W. Grosinger, M.W. Kapp, J.S. Micha, O. Ulrich, G. Dehm. Impact of instrumental constraints and imperfections on the dislocation structure in micron-sized Cu compression pillars, Acta Materialia 59 (2011) 5618-5626