

IN SITU DEFORMATION OBSERVATION VIA EBSD AND EDS DURING HIGH TEMPERATURE TENSILE TESTING

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Tensile testing is the backbone of mechanical characterization for materials science. The possibility to combine mechanical testing with advanced imaging and characterization methods and the option to operate at high temperatures up to 800°C opens a large variety of possibilities for materials research. In this work in situ annealing experiments are shown, where the grain growth is observed via EBSD over the course of the experiment. Different annealing states are achieved and tested after cooling to room temperature. Using the EBSD information, high Schmid factor grains can easily be identified and monitored during the in situ tensile experiment and therefore even the first yielding grains are captured. Further in situ high temperature tensile tests on steel samples up to a temperature of 800 °C are presented. An example of a tested steel specimen is shown in Figure 1. Here, slip band formation is easily observable in BSD contrast. By enabling feature tracking, the chosen region of interest remains in the field of view and is imaged correctly. Such experimental capability pave the way for high throughput material data collection to build up a database of microstructural characteristics in combination with macroscale material performance. This work describes a number of use cases demonstrating the new automated capabilities.

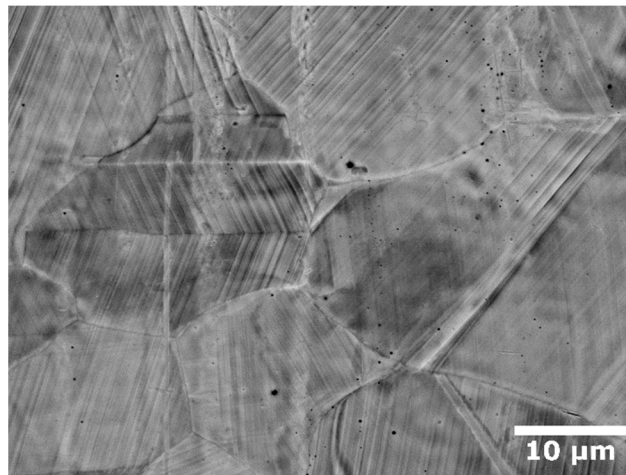


Figure 1 – Slip band formation in stainless steel during in situ experiment in BSD contrast.