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Defect Imaging Using the Positron-Microbeam of the CDB Spectrometer at NEPOMUC

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The coincident Doppler broadening (CDB) spectrometer at the positron beam facility NEPOMUC of the research neutron source FRM II enables depth dependent and spatially resolved defect studies by using Doppler broadening spectroscopy (DBS), and element-specific measurements with coincident DBS. In order to investigate the near-surface region and the bulk of a sample, the positron implantation energy can be set up to 30 keV. With a new optional brightness enhancement system, a lateral resolution of 33 μm can be achieved. First measurements on laser beam welds fabricated out of high strength age hardened Al alloys demonstrate the improved performance of the upgraded instrument. The visualization of the defect distribution revealed a sharp transition between the raw material and the welded zone indicating a very small heat affected zone. By coincident DBS the variation of the Cu precipitates and the dissolution of the Cu atoms within the weld could be clearly visualized. Financial support within the project no. 05K16WO7 by the BMBF is gratefully acknowledged.

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