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Measurement of the Vacancy Formation Enthalpy of Lanthan at 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) of the positron-electron annihilation line. 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 heatable sample holder temperature dependent in situ defect spectroscopy can be performed from room temperature up to 1000 K. Within this study the vacancy formation enthalpy of La and Cu as reference material was determined by temperature dependent DBS. First, the as-received samples were annealed in situ, i.e. the decrease of the so called S-parameter indicated the annealing of lattice defects. During a second heating cycle the increase of the vacancy concentration was clearly observed from which the vacancy formation enthalpy could be calculated.

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