EUV spectroscopy on highly-charged tin ions in an electron beam ion trap

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Extreme ultraviolet (EUV) light emission from highly-charged tin ions in laser-produced plasma is used in state-of-the-art nanolithography. We present EUV spectroscopy of the relevant Sn^{7+} – Sn^{20+} ions trapped in an electron beam ion trap (EBIT) at the Max Planck Institute for Nuclear Physics in Heidelberg, Germany. A matrix inversion technique is introduced to obtain true charge-state-resolved spectra from the measured experimental spectra. Accurate determination of the transitions of highly-charged tin ions is indispensable for producing high-quality atomic data to feed in opacity tables to simulate and optimize the plasma. Intriguingly, we show that the resonance transitions $4p^{m} – 4p^{m-1}4d$ (m=5-4) of Sn^{15+} and Sn^{16+} ions, which have not been previously investigated, contribute in the 2% bandwidth around 13.5 nm that is relevant for nanolithography.