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Emission of tin plasmas for lithography applications[1] JAMES COLGAN, AMANDA NEUKIRCH, DAVID KILCREASE, JOE ABDALLAH, MANOLO SHERRILL, CHRIS FONTES, PETER HAKEL, Los Alamos National Laboratory, FRANCESCO TORRETTI, RUBEN SCHUPP, JORIS SCHEERS, OSCAR VERSOLATO, Advanced Research Center for Nanolithography — We employ the Los Alamos suite of atomic physics codes and the plasma kinetics modeling code ATOMIC to compute the LTE emissivity of Sn in plasma regimes of interest to EUV lithography applications. Detailed comparisons are made with laser-produced plasma measurements performed from Sn microdroplets. Excellent agreement is found between the calculations and measurements. The atomic structure calculations had to include significant configuration-interaction effects to properly predict the position of the huge number of transitions that contribute to the Sn emissivity in the EUV wavelength region. We found that excited-to-excited transitions, for which the energy level structure is more difficult to predict, make a surprisingly large contribution to the emissivity in this region. It was also found necessary to vary the scale factors that modify the various integrals within the CATS (Cowan) atomic structure code to obtain best agreement with the measured emission. The computed LTE emission from a single temperature (32 eV) and mass density (0.002 g/cm^3) was in very good agreement with the measured emission for both the position and width of the broad, intense emission feature centered at 13.5 nm.

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