Revised optical constants of Tantalum for EUV mask absorber materials

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The ability to model EUV mask architecture relies on an accurate knowledge of the optical constants of materials used for the absorber/phase shift layer. Unlike the visible /UV, in the EUV it is often possible to predict the optical constants of a material from the composition and density using the atomic scattering factors. This approach is used at the CXRO website (www.cxro.lbl.gov). The atomic scattering factor data rely heavily on published experimental measurements.

Motivated by poor agreement between the measured and predicted index of refraction of Ta based mask materials the atomic scattering factors of Tantalum were reevaluated. Measurements of the transmission of freestanding Ta films were performed over a wide range of wavelengths. Discrepancies of approximately 20% were found at 13.5 nm. Using the updated Ta atomic scattering factors yields much better agreement with measured TaN optical constants. The data maintained at the CXRO website have been revised based on these measurements. Supported by the U.S. Department of Energy under Contract No. DE-AC02-05CH11231.

Key word: EUV, Ta (Tantalum), optical constants, atomic scattering factor, absorber