

Optical property constant calculation for Advanced absorbers application

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EUV lithography has been widely considered as the next generation lithography technology for 5nm node and below. However, with the shrinkage of the feature size, Mask 3D effect (shadowing effect) has become an important factor affecting the resolution of the pattern print. Mask 3D effect can be reduced by reducing the absorber thickness. In addition, materials with a refractive index closer to vacuum will reduce the phase jumps at the vertical absorber edges and thus reduce focus effects.¹

Te and TeO₂ are good candidates because of high k and n closer to 1. The optical properties of the films have been investigated by SSLS (Singapore Synchrotron light source). Film thickness, interface roughness, surface roughness and n & k values (*Figure 1*) at different wavelength was obtained by fitting. Fitting values are used for simulating reflectance of Te and TeO₂ on MLs, fitting reflectance curves matches well as the measurement data @13.5nm EUV beamline. Fitting values are also used for calculation for reflectance vs film thickness. *Figure 2* shows 25nm Te (or TeO₂) thickness was able to achieve $\leq 2\%$ reflectance.

¹ V. Philipsen et al, SPIE 041002 (2017)

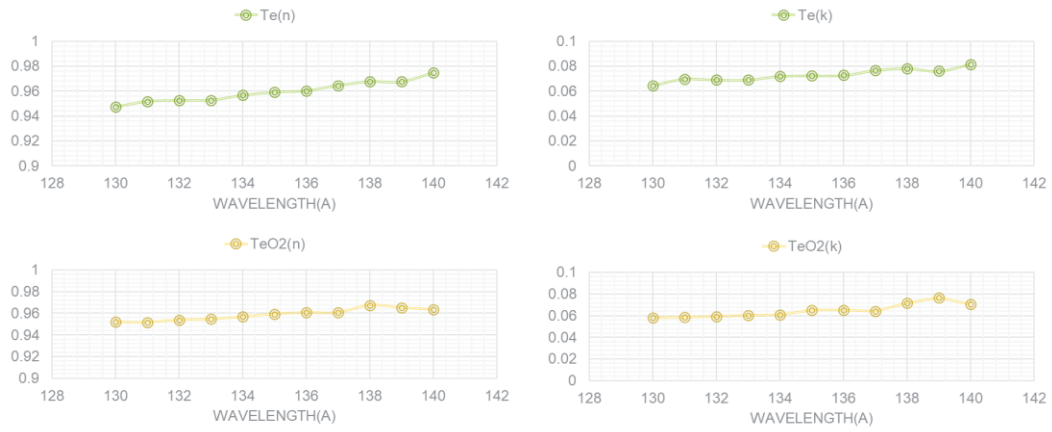


Figure 1: Simulated n , k values for Te and TeO_2 at different wavelength

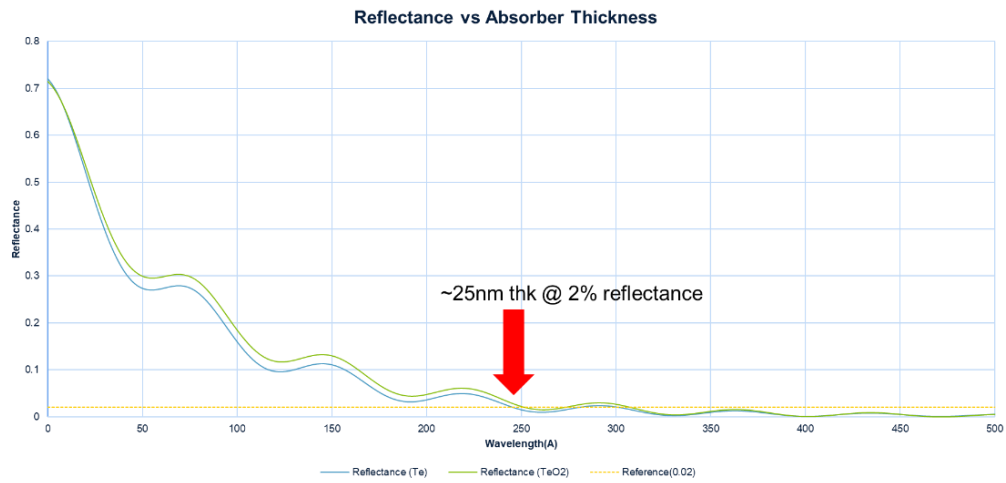


Figure 2: Te and TeO_2 reflectance vs absorber thickness