1. Title:	Thermal- and Electron-Induced Reactions on the Ru(10-10) Surface: Relevance to Extreme Ultraviolet Lithography
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3. Abstract body:

Our goal is to provide insights into surface processes that affect the reflectivity of Ru-coated mirrors used in extreme ultraviolet (EUV) lithography applications. Several techniques, including temperature programmed desorption (TPD), x-ray photoelectron spectroscopy (XPS), low energy ion scattering (LEIS) and electron stimulated desorption (ESD), are used to characterize thermally-induced and electron impact-induced surface reactions of gases found typically in vacuum chambers of EUV lithography systems. We present data concerning the interaction of acetone and water vapors with clean, O-covered and C-covered Ru(10-10) surfaces. A 100 eV electron beam is used to mimic excitations initiated by 13.5 nm wavelength radiation employed in EUV applications. The clean Ru surface is readily covered by carbon by the thermally-induced dissociation of acetone, but this reaction demonstrates different behaviour on the preoxidized Ru. There, reactivity is sensitive to the concentration of defects (O-vacancies), and gentle heating causes removal of O as CO and H2O. Water is weakly bonded on air-exposed or carbon-covered surfaces; however, water becomes more strongly bonded to a partially oxygen-dosed substrate. Electron bombardment in an H2O background leads to electron-induced buildup of an oxygen layer. Exposure to H-atoms causes removal of O via H2O formation. Our results may provide insights into contamination and mitigation processes that affect EUV mirror lifetime [1].

[1] T. E. Madey, B. V. Yakshinskiy, N. S. Faradzhev, N. V. Edwards, Appl. Surf. Sci. (2006), in press.