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Formation of graphene-like carbon layers on TiO2(110) and Al2O3 and their relevance for protecting EUV mirrors CHUANDAO WANG, SHAO-CHUN LI, ULRIKE DIEBOLD, Department of Physics, Tulane University, New Orleans, LA 70118, ROMAN CAUDILLO, Components Research, Intel Corporation, Hillsboro, OR 97124, USA — Extreme ultraviolet lithography (EUVL) uses short-wavelength photons (13.5 nm) to increase patterning density in IC manufacturing. Because EUV photons are strongly absorbed, multilayer reflective optics in high vacuum must be used. An active area of research is the development of a capping layer that prevents the carbon contamination and oxidation of EUV mirrors. Here, two model capping layers, a single crystal rutile TiO_2(110) surface and an ultrathin Al_2O_3 film grown on NiAl(110), were employed to investigate the fundamentals of adsorption and photo-induced oxidation processes. Using catechol ($C_6H_6O_2$) as a model contaminant, the adsorption and uv-induced (248 nm) removal in various gaseous atmospheres were investigated using x-ray photoelectron spectroscopy (XPS)&scanning tunneling microscopy (STM). When catechol overlayer is heated to 400°C, some of the molecules desorb and the XPS signature of the remaining C suggests a graphene-like overlayer. Repeated adsorption/flash cycles result in a layer with self-limited thickness of 1.6 monolayers that is inert against further adsorption. Using such a layer for protecting EUV mirrors is being explored.

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