Gd and O depositions on Si(113)

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The co-adsorption of gadolinium and oxygen on high-index Si(113)–3x2 plane has been investigated.

The aim of the present work was to study experimentally the co-adsorption of gadolinium and oxygen on high-index Si(113) surfaces and to determine the correlation between electronic and adsorption properties of such interfaces.

The experiments were done in the homemade ultra-high vacuum chamber with a base pressure $\approx 2\times10^{-10}$ Torr. Gd was evaporated by resistive heating of a tantalum filament. Atomic oxygen generation was performed by hot tungsten filament. Auger electron spectroscopy, low-energy electron diffraction, ultra-violet photoelectron spectroscopy (UPS) were used for analyzing the adsorption systems.

The Si(LVV), Gd(NON) and Gd(NVV) Auger line shapes were investigated with increasing of Θ_{Gd}. They indicate on forming a well-defined silicide-type interfacial reaction product.

UPS measurements have shown that the work function of Si(113) surface monotonously decreases with increasing of Θ_{Gd}. At $\Theta_{Gd} \approx$ 6ML the work function decreases to $\approx$ 1.2eV and becomes stabilized.

The exposure of Gd films in atomic oxygen atmosphere was accompanied by the reduction of electronic state density near the Fermy level, oxidation of Gd atoms and some work function rising by the change of band bending near the surface.

The preliminary model that provides the explanation of correlation between structure and the work function of Si(113):Gd:O system is discussed.