Tuesday Evening, May 21, 2019

Special Interest Talks
Room Town & Country - Session SIT1-TuSIT

Special Interest Session I
Moderators: Christopher Muratore, University of Dayton, **Michael Stüber**, Karlsruhe Institute of Technology, Germany

7:00pm **SIT1-TuSIT-1 Advanced Monitoring of Thin Film Growth from Real-time Diagnostics***, Grégory Abadias,* Institut Pprime - CNRS - ENSMA - Université de Poitiers, France **INVITED**

Thin metallic films deposited on Si are largely used in many technological areas, such as microelectronics, catalysis, architectural glazing or plasmonics. In the case of high-mobility metals on weakly interacting substrates (e.g. Ag on SiO_2), the growth proceeds in a 3D fashion, known as Volmer-Weber. The control of islands size and shape at the beginning of growth is vital for many applications as the characteristic length scales and physical attributes of ultrathin films are mostly set-in during the coalescence stage.

By employing a panel of *in situ* and real-time diagnostics, we could obtain valuable insights on the thin film growth dynamics as well as stress evolution in a variety of sputter-deposited metallic systems (Ag, Cu, Au, Ta and Mo). More particularly, the characteristic thickness of film percolation and film continuity can be determined from a combination of real-time electrical resistivity and wafer curvature measurements. This will be highlighted for the case of Ag and Cu deposited on amorphous carbon as a function of deposition flux F and substrate temperatures T_s.

We will also provide examples on how chemical alloying or interface reactivity can affect the growth morphology and stress evolution of Ag and Cu films. Growth monitoring was performed *in situ* by employing either surface differential reflectance spectroscopy or spectroscopic ellipsometry. We will show that strategies based on interfacial or alloying design can be efficiently employed to manipulate growth and obtain ultra-thin, ultra-smooth, continuous layers.

Finally, we will discuss the issue of phase transformation during growth of ultrathin layers, with special focus on silicide formation. By coupling simultaneously X-ray diffraction, X-ray reflectivity and wafer curvature during sputter-deposition of metal layers on amorphous Si, information about thickness-dependent crystalline phases, texture, grain growth and microstrain can be gained. This will be demonstrated for Mo/Si and Pd/Si systems. A complex nanostructure formation is uncovered from these synchrotron studies, pointing out to different silicide formation mechanisms and subsequent structural development.

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