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Tutorial #1

Thin film nucleation and growth

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Thin-film technology is pervasive in many applications, including microelectronics, optics, magnetics, hard and corrosion resistant coatings, micromechanics, etc. Progress in each of these areas depends upon the ability to selectively and controllably deposit thin films (thickness ranging from tens of angstroms to micrometers) with specified physical properties. This, in turn, requires control – often at the atomic level – of film microstructure and microchemistry. In this module, the fundamental mechanisms that control vapor condensation, atomic diffusion, island nucleation and growth, island coalescence and coarsening, and continuous film formation will be described briefly discussed. Experimental results and simulation data related to growth in homoepitaxial systems, as well as to growth in polycrystalline weakly-interacting film/substrate systems, will be used as illustrative examples. The effect of energetic bombardment on film microstructural evolution will also be highlighted.

About the lecturer

Kostas Sarakinos is Professor at the Department of Physics at the University of Helsinki, Finland, and Guest Researcher at the Royal Institute of Technology (KTH) in Stockholm, Sweden. Kostas's research interests include atomistic processes during film nucleation and growth, growth manipulation, in situ growth monitoring, and deterministic and stochastic film growth simulations. He has co-authored 80 papers, 4 book chapters, and 1 book. He teaches courses related to materials, surface, and thin-film physics at undergraduate and post-graduate level.