

Course outline:

Control of Micro- and Nanostructure Evolution during Sputter-Deposition

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- 1) Control of microstructure evolution during sputter-deposition
 - a) Film growth processes—nucleation, coalescence, competitive grain growth, recrystallization
 - b) Zone diagrams
 - c) Epitaxial growth
 - d) Effects of reactive species.
- 2) Use of low-energy ion bombardment to control microstructure during low temperature film growth
 - a) Effects of sputtered atoms energy
 - b) Effects of gas ion energy
 - c) Use of high fluxes of low-energy gas ions
 - d) Metal-ion assisted growth – dense, stress-free films; a) Use of synchronized bias in HIPIMS
 - e) Kinetic roughing and surface facet formation
 - f) Texture inheritance
 - g) Metal-ion etch and adhesion control
- 3) Self-organized nanostructure formation
 - a) Thermal segregation and renucleation – random nanocomposites
 - b) Ion-assisted segregation – highly-oriented nanocomposites; equiaxed to columnar transition
 - c) Resputter yield amplification: HfAlN
 - d) Self-organized 3D superlattices via vacancy ordering
 - e) SiO_x Nanowires by ion-enhanced vapor-liquid –solid (VLS) growth