

Thin Films E5125 Learning goals

Student can describe the following concepts and compare them with each other.

Surface engineering and vacuum

- Surface phenomena
 - Surface structure, energy, reconstruction
 - Adsorption&desorption
 - Surface diffusion
- Energetic ion-surface interactions
- Vacuum
 - Vacuum system
 - Pressure units
 - Residual gas
 - Formation time of a monolayer on surface
 - Pumps
 - Vacuum gauges

PVD

- Principle ideas of plasma: glow discharge and arc
- Sputter mechanism
- Thornton diagram: microstructure as function of ion energy and substrate temperature
- Subplantation
- Residual stress
- Magnetron sputtering
- Pulsed MS (HIPIMS)
- Reactive sputtering
- Arc deposition
- Pulsed laser deposition
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Characterization

- Role of vacuum in characterization methods
- Thickness
- Residual stress
- ion beam characterization
 - SIMS
 - Rutherford Back Scattering (RBS), and Forward Recoil Spectroscopy
- X-ray spectroscopy
 - Glancing angle XRD
 - X-ray reflection XRR
- XPS- ESCA
- RAMAN
- Indentation, nanoindentation

CVD/ALD

- Thermal CVD process,
 - Precursors
 - Mass transport
 - Silicon growth
- Plasma assisted CVD
 - Plasma enabling lower deposition temperature
 - Hydrogen content
 - Reactor architectures
- ALD
 - Growth process
 - Process window
 - Reactor architectures
 - Conformality
 - Materials
- Applications

Other coating methods

- Electroplating
- Electroless deposition
- Spin coating
- Dip coating
- Langmuir-Blodgett method
- Sol-Gel
- Flame Spray