



UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Theory and modelling of epitaxy

2223-116R-M1

Titolo

Theory and modelling of epitaxy

Docente(i)

Dr. Roberto Bergamaschini

Lingua

English

Breve descrizione

The course provides a general introduction to the physics of epitaxial growth, offering an overview of the key thermodynamic and kinetic factors driving the formation of thin-films rather than three-dimensional micro- or nano-structures during material deposition.

The topics will include:

1. General concepts of epitaxy and experiments
2. Growth methods

- physics of crystal growth
 - review of key experimental growth methods: LPE, MBE, CVD, ALD
 - characterization techniques: STM/AFM, LEED, RHEED
3. Surface energy and crystal shape
 4. Continuum models of morphological evolution
 - Mullins model: thermal smoothing
 - kinetic effects and Kinetic Wulff shape - The Asaro-Tiller-Grinfeld instability and beyond
 5. Nucleation theory and island growth
 6. Atomistic growth mechanisms
 - Solid-on-solid model and concept of KMC
 - step kinetics model
 - Erlich-Schwoebel barrier and step bunchings
 7. Plastic relaxation in epitaxy
 - dislocations, types and properties - dislocations in films and critical thickness
 - dislocated islands
 8. Self assembly and nanostructures: QD, QW, NW
 - ordering and substrate patterning
 - top-down approach: selective area growth
 - droplet epitaxy
 - the vapour-liquid-solid (VLS) growth mode and Nanowires
 - core-shell structures

CFU / Ore

2 CFU / 16 hours

Periodo di erogazione

Febbraio

Sustainable Development Goals

ISTRUZIONE DI QUALITÀ
