PHYS-747

Introduction to Metalorganic Vapour Phase Epitaxy of III-V semiconductors

Cantoni Marco, Dwir Benjamin, Grandjean Nicolas, Rudra Alok

Cursus	Sem.	Type
Physics		Obl.

Language of teaching	English
Credits	1
Session	
Exam	Oral
Workload	30h
Hours	**15**
Courses	15
Number of positions	**15**

Frequency

Every year

Remark

Every year / Next time: Spring 2019

Summary

This course offers an insight into the science of epitaxial growth, a chapter of surface science requiring basic understanding of thermodynamics, crystallography, electronic and optical properties of semiconductors.

Content

The course will cover the following chapters:

1. **Overview of the MOVPE process (2h)**
   - a. Atomic level growth processes
     - i. Adsorption and desorption
     - ii. Adatom and step motion
     - iii. Surfactant effects
   - b. Influence of surface processes
     - i. Growth modes
     - ii. Dopant incorporation
     - iii. Selective growth
     - iv. Non-planar growth
2. **Instrumentation (3h)**
   - a. Overall architecture
   - b. Source molecules
     - i. Group III
     - ii. Goup V sources
   - c. Gas distribution
   - d. Growth chambers
   - e. Growth parameters
   - f. Safety management
   - g. Lab visit
3. **Epitaxial layer characterisation (3h)**
   - a. Visible light microscopy
   - b. Scanning probe microscopy (AFM, STM)
   - c. Scanning Electron Microscopy
   - d. Transmission Electron Microscopy
   - e. X ray diffractometry
   - f. Photoluminescence spectroscopy
   - g. Chemical profiling
4. **Specific materials (3h)**

a. GaAs & related alloys
b. InP & related alloys
c. III-V nitrides

5. **Examples of GaAs based nanostructures (3h)**
   a. Pyramidal quantum Dots
   b. Selective area growth of nanowires

Note

Metalorganic Vapour Phase Epitaxy (MOVPE) is one of the main fabrication techniques of a large variety of widely studied semiconductor materials of key relevance for modern optoelectronic devices

Keywords

Epitaxy, III-V semiconductors, nanostructures

Resources

Bibliography

"Organometallic Vapor-Phase Epitaxy: theory and practice", Academic Press, 2nd Ed., 1999 - G.B. Stringfellow