Introduction to Metalorganic Vapour Phase Epitaxy of III-V semiconductors

Cantoni Marco, Dwir Benjamin, Grandjean Nicolas, Leran Jean-Baptiste, Rudra Alok

Frequency
Every year

Remarque
Next time: Spring

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. Group 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

Ressources en bibliothèque