

Sujet Master

Laboratoire ICUBE

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Titre : Deposition and characterization of doped nanoparticles embedded in silicon oxynitride thin layers.

Résumé :

The aim of this training is to synthesis structures based on semiconductors thin films containing doped silicon nanoparticles. The ultimate goal is demonstrating the possibility to form thin layers with tunable gap energies in order to absorb light at different wavelength.

First, silicon rich silicon oxynitride (SRON) layers should be elaborate at ICUBE laboratory by using an Electron Cyclotron Resonance Plasma-Enhanced Chemical Vapor Deposition (ECR-PECVD) system. The deposition will be followed by thermal annealing to generate the demission phase and consequently the formation of silicon nanoparticles embedded in a SiON matrix (Si-SiON). As a second step, the layers Si-SiON will be ion implanted by arsenic or boron and eventually annealed.

A systematic study of the structural and optical properties of the Si-SiON (before and after a thermal treatment) will be carried out. A large panel of characterization tools is available at the laboratory to study the SiON thin layers (FTIR spectroscopy, photoluminescence spectroscopy, ellipsometric spectroscopy, micro-Raman analysis and observation of the nanoparticles by transmission electronic microscopy. Possibly, electrical measurements are envisaged to determine the layers conductivity so as to elaborate a PN junction which the I(V) characteristic will be studied.