Growth, doping, structural and optical properties of polar and non-polar nitride-based quantum dots.

by B. Daudin CEA-Grenoble,DRFMC SP2M/PSC 17 rue des martyrs 38054 Grenoble Cedex 9, France.

abstract:

One fascinating aspect of III-V nitride semiconductors is the possibility to control their growth mode by varying parameters such as the growth temperature or the metal/nitrogen ratio value. As growth mode is directly related with the strain relaxation mechanism of nitride heterostructures, a simple tuning of growth parameters allows one to grow either quantum wells (QWs) or quantum dots (QDs), depending on the desired application.

The growth conditions for the elaboration of (0001) polar and (11-20) non-polar GaN quantum dots by molecular beam epitaxy (MBE) will be discussed. AFM, photoluminescence, MEIS (medium energy ion scattering) and TEM characterization of these dots will be presented. The issue of the huge internal electric field which governs to a large extent optical properties of GaN QDs will be detailed. A special emphasis will be put on doping of GaN QDs with rare earth ions which opens a promising way for the realization of visible light emitting diodes.