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Lattice location of dopants in group-III nitrides and ZnO

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The properties (electric, optic, and magnetic) of impurities and dopants in semiconductors are strongly dependent on the lattice sites which they occupy. Although the main occupied site, for a given impurity-host combination, can often be predicted based on chemical similarities between impurity and host elements, such expectations fail in many cases. Furthermore, minority sites (in case of multiple-site occupancy) are even more difficult to predict, detect and identify. In this talk, we give an overview of recent lattice location studies for impurities and dopants in ZnO and GaN, as representative wide-gap semiconductors. These experiments are based on the emission channeling (EC) technique, using radioactive isotopes produced at the ISOLDE facility at CERN. EC makes use of the charged particles emitted by a radioactive isotope upon decay. The screened Coulomb potential of atomic rows and planes determines the anisotropic scattering of the particles emitted isotropically during the radioactive decay. Along low-index directions of single crystals and epitaxial films, this anisotropic scattering results in well defined channeling or blocking effects. Because these effects strongly depend on the initial position of the emitted particles, they result in emission patterns which are characteristic of the lattice site(s) occupied by the probe atoms. In this talk, we present some particular cases that illustrate the strengths of emission channeling when studying systems exhibiting multiple-site occupancy.

Are you currently a postgraduate student? (Yes/No)

No

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