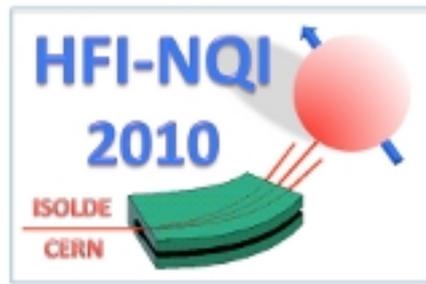


HFI/NQI 2010



Contribution ID : 57

Lattice location of beryllium and boron, measured by thermal-neutron-induced emission channeling measurements

Content :

*

Summary :

Emission-channeling (EC) is a powerful experimental technique to pin down the exact site of atoms in a crystal lattice [1]. For EC typically radioactive isotopes are implanted that subsequently emit alpha or low-energy beta particles or conversion electrons. Unfortunately several elements have no radioisotope with suitable half-life and charged particle energies. However, if the element in question has an isotope with high cross-section for thermal neutron-induced proton or alpha emission, these charged particles can be produced by exposing the sample to an intense neutron flux. This technique was explored already 30 years ago by Biersack et al. at Institut Laue Langevin [2,3]. However, then the 2D particle detector covered only a fraction of the solid angle of the EC pattern and a measurement of a total EC pattern required the lengthy separate measurement and subsequent overlay of tens of spectra. Today, modern silicon pixel detectors can cover the entire EC pattern in a single measurement. We will present results of the first use of the TimePix detector for thermal neutron induced charged particle emission channeling measurements. The semiconductor pixel detector TimePix (256 x 256 pixels) is a successor of the Medipix2 device. Timepix pixels can be operated in the so-called Time-over-Threshold (TOT) mode allowing direct measurement of the energy deposited in each pixel [4]. We observed EC patterns with bulk LiF crystals (with ${}^6\text{Li}$ at its natural isotopic composition of 7.5%) and in highly ${}^{10}\text{B}$ doped diamond. The latter samples become superconducting at a T_c of several K [5]. Today intense ${}^7\text{Be}$ beams can be produced at ISOLDE-CERN, allowing the doping of samples with several 10^{15} atoms of ${}^7\text{Be}$ within few hours [6]. We also studied the EC patterns of ZnO implanted with ${}^7\text{Be}$ at ISOLDE. Clear EC patterns could be observed for all these samples. Prospects for lattice location studies of beryllium and boron by neutron-induced charged particle EC in a variety of materials will be discussed.

References

[1] U. Wahl, Phys. Rep. 280, 146 (1997).

- [2] J.P. Biersack et al., Nucl. Instr. Meth. 149, 93 (1978).
[3] J.P. Biersack et al., Nucl. Instr. Meth. 188, 411 (1981).
[4] J. Jakůbek et al., Nucl. Instr. Meth. A560, 143 (2006).
[5] E. Bustarret et al., Phys. Rev. Lett. 93, 237005 (2004).
[6] U. Köster et al., Nucl. Instr. Meth. B204, 343 (2003).

Sponsored accomodation :

no

Contribution :

either

Primary authors : KÖSTER, Ulli (Institut Laue Langevin Grenoble)

Co-authors : BUSTARRET, Etienne (Institut Néel, CNRS Grenoble) ; CORREIA, Guilherme (Instituto Tecnológico e Nuclear Sacavém) ; GRANJA, Carlos (Czech Technical University Prague) ; JAKŮBEK, Jan (Czech Technical University Prague) ; UHER, Josef (Czech Technical University Prague) ; VACIK, Jiri (Nuclear Physics Institute, Czech Academy of Sciences, Řež near Prague) ; WAHL, Ulrich (Instituto Tecnológico e Nuclear Sacavém)

Presenter : KÖSTER, Ulli (Institut Laue Langevin Grenoble)

Session classification : --not yet classified--

Track classification : New Directions and Developments in Methodology

Type : POSTER