



Contribution ID: 62

Type: oral

## Solid state physics at ISOLDE: using radioactive ion beams to study materials

*Sunday, 28 March 2010 09:20 (20 minutes)*

At the radioactive ion beam facility, ISOLDE-CERN, more than 900 isotopes of 70 elements are produced and delivered as radioactive ion beams of high elemental and isotopic purity. At ISOLDE an extensive solid state programme of research has been in place for many years and continues to develop and expand by the year. This activity embraces a wide range of techniques and materials.

Among the techniques used are those which utilize nuclear properties such as Perturbed Angular Correlation (PAC), Emission channeling (EC), Mössbauer spectroscopy and  $\mu$ -NMR. These methods are capable of probing the local environment of the host material and provide important and often unique hyperfine data. In addition to these techniques traditional semiconductor spectroscopies such as Deep level Transient Spectroscopy (DLTS), Photoluminescence (PL) and diffusion gain extra sensitivity and yield chemical information when combined with radioactivity.

The materials studied have changed as research priorities in the world at large have changed. Nowadays the bulk of the semiconductor work is focused on compound materials such as ZnO, GaN and CdTe. In addition Multiferroic materials such as  $R\text{MnO}_3$  ( $R = \text{Tb}, \text{Dy}$ ) (among others) now account for significant proportion of the beamtimes, along with studies of high  $T_c$  Superconductors. One of the advantages of many of the techniques which utilize radioactive probes –such as PAC –is their flexibility to be applied to a wide variety of materials. This has allowed us to pursue a very active biophysics program in parallel with the more “traditional” solid state work. These experiments use the implanted radioactive ions to study the local environment of proteins, complementing and enhancing similar experiments using NMR and synchrotron radiation.

In this talk I will detail the recent successes of experiments at ISOLDE, and of the unique advantages that radioactive probes can bring. Results from the previous few years will be presented from the main areas of work: semiconductor physics, multiferroic materials and biophysics.

Abstract submission for oral presentation.

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**Session Classification:** Materials I

**Track Classification:** Materials science, nanomaterials