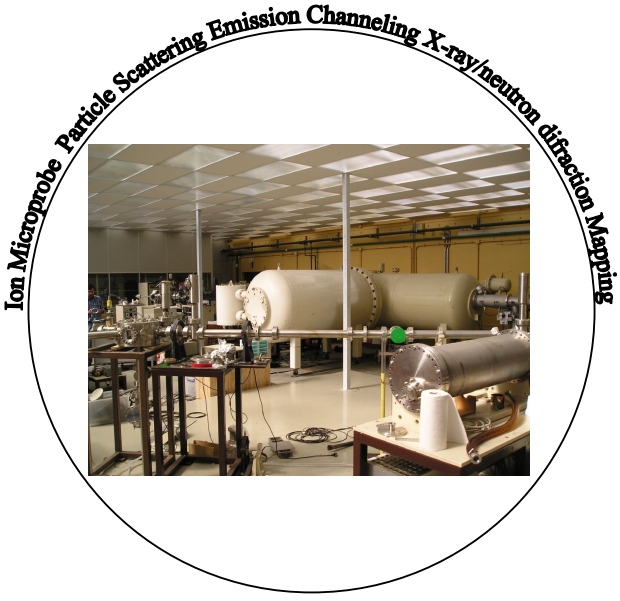
Physics Sector



Physics

Eduardo Alves

During 2006 the activities in the Physics Department kept focused on Applied and Fundamental Research of Materials, Environment and Health Sciences. The groups maintained their commitment to engage post graduated students (M.Sc., Ph.D.) in the running projects. This collaboration has been instrumental for the high output and scientific level of the research work in the department. The Physics department was enriched by new equipments and instruments bought under the framework of a reequipment programme. These have been integrated in the existing facilities.

1 – Ion Beam Laboratory (IBL) comprises a 2.5 MV Van de Graaff Accelerator with an ion microprobe end-station, a new 3 MV tandem accelerator with an AMS system, and a 210 kV high fluence ion implanter. This infrastructure is open to external users and the experimental studies cover the fields of Materials Science, Environment, Health, Biomedical, Atomic and Nuclear Physics (cross-section measurements). The research highlights will appear in the next pages under the headings ***Advanced Materials Research Group, Elemental Characterization and Speciation Group, Group of Biomedical Studies***, and ***Nuclear Reactions Group.***

2 – High Temperature Materials Laboratory (MA^3T) is equipped with a high-resolution, high-temperature diffractometer (*Hotbird*) with a new high resolution line for low dimensional structures studies. The *Hotbird* with its high specificity and enhanced capabilities is used to solve difficult problems in advanced materials, *e.g.* materials used in the electronics industry, high temperature alloys for fusion applications, superconductors, *etc*. The research activity in the laboratory is merged with the Advanced Materials Research Group.

3 – Neutron Spectrometers Laboratory at the RPI, the nuclear research reactor facility, comprises one 2-axis diffractometer (*DIDE*), one SANS instrument (*EPA*), and a TOF diffractometer for educational purposes. A new detector assembly for the *DIDE* instrument is projected and awaits a funding decision. To improve the signal-to-noise ratio at the *EPA* facility a cryostat is being designed for the installation of a 20 cm long Be filter in the neutron beam line. R&D on new copolymers (HEMA grafted on LPDE thin films) suitable for bioapplications and hybrid materials prepared by γ-irradiation are in progress in collaboration with groups in Coimbra, Aveiro, Saclay, and Budapest. Activities are presented under the heading ***Condensed Matter Physics.***

4 – Ionising Radiation Laboratory has been running to develop applied research for industrial purposes. The research makes use of a Co-60 irradiation unit, UTR, with a semi-industrial dimension. In order to develop new radiation technology applications, the upgrading and renewal of the equipment have been carried out by the "*Radiation Technologies: Processes and Products Group*". This project implies ionizing radiation equipment, *e.g.* electron accelerator and gamma experimental facilities, a multidisciplinary laboratory with controlled environment and application of robotic--automation systems in the facilities. The main R&D activities for the application of ionising radiation are described under the heading ***Radiation Technologies: Processes and Products Group.***

5 – Nuclear Instruments and Methods Laboratory activities are focused in modelling radiation fields, calculating neutron physics parameters, measuring neutron cross-sections and application of electric discharges in analytical methods and environmental problems. The design of instrumentation for nuclear applications, and providing of specialized technical assistance in nuclear instrumentation is also part of the activities carried out, which are presented under the title ***Nuclear Instruments and Methods.***

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