

Chemistry Sector



Chemistry

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Research conducted at the Department is dedicated to the development on the synthesis of inactive and radioactive compounds oriented to the progress in health and materials sciences and catalysis. A major field is the use of nuclear based and related methods to environmental and earth sciences and cultural heritage. Activities are organized in five areas:

Solid State – the group focus its research activity on new materials with unconventional electrical and magnetic properties. It combines a high expertise on preparative chemistry of molecule based conducting and magnetic materials and of intermetallic compounds with a wide range of specialized solid state techniques. The group has started officially its participation in the EC Network of Excellence MAGMANet.

Inorganic and Organometallic Chemistry – group is concerned in the synthesis, characterization and chemical reactivity of 4f and 5f compounds. Gas-phase ion chemistry studies of highly radioactive actinides by FTICR/MS have been continued. Oxidation studies of monopositive and dipositive actinide ions were pursued, with a focus on Pa and Cm. Studies on the reactivity of [U(TpMe₂)₂] have been accomplished as well as those based on the U(III) and U(IV) complexes, [U({SiMe₂NPh})₃-tacn}] and [U({SiMe₂NPh})₃-tacn}X] (X = halide and diphenylamide). New enthalpies of formation for alkaline-earth metal and lanthanide substituted phenoxides were measured.

Inorganic and Radiopharmaceutical Chemistry – the research of the group is focused on the design, synthesis and characterization of specific radioactive probes with potential interest on Nuclear Medicine diagnostic or therapy, namely halogen and metal *d*- and *f*- based radiotracers. Synthesis and evaluation of radiohalogenated estradiol analogues pursued and unprecedented ^{99m}Tc building blocks for labelling biomolecules and promising Ln complexes for bone pain palliation have been introduced. Among different training activities IRC team coordinated a Master Course, participated in the European Radiopharmacy Course/INSTN, has been partner in the EC/COST RTD ACTION, Virtual Radiopharmacy/V Framework Program and in the Coordination-Action on Education

and Training in Radiation Protection/VI Framework Program.

Environmental Analytical Chemistry –research is focused on Instrumental Analytical Chemistry, Environmental Geochemistry, Isotope Hydrology, Oceanography, and Archaeometry. Some domains were reinforced, in particular the use of light isotopes on the assessment effects and vulnerability due to agricultural practices and industrialised areas as sources of pollution in sediment and diverse hydrological domains. Sediment transport and evolutionary patterns of recent and palaeo-environments along the Iberian shelf were evaluated.

Cultural Heritage and Sciences – Geochemistry of the earth surface, mineralogy and absolute dating are the main research domains, applied to archaeometry, environmental geology and palaeoenvironmental reconstruction. The study of movable and immovable cultural heritage has proceed, and it is also important to emphasize the analysis of former coastal and archaeological environments, by using nuclear methods and luminescence dating, contributing to a better knowledge of the Portuguese Quaternary climate change scenario and landscape evolution.

National and international projects with the scientific coordination of the Department are been carried out. Under the National Scientific Infrastructure Programme an INAA gamma-spectrometer with sample changer, a single grain luminescence reader, a SQUID magnetometer, an ICP-MS, and an ESI-QITMS are being acquired and news laboratories are being installed

Education and training of Undergraduate, MSc, PhD and Post-doc students due to our specialized existing facilities has been highly enlarged as well as the participation of Researchers in advanced training activities in collaboration with many universities and in the context of international networks.

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