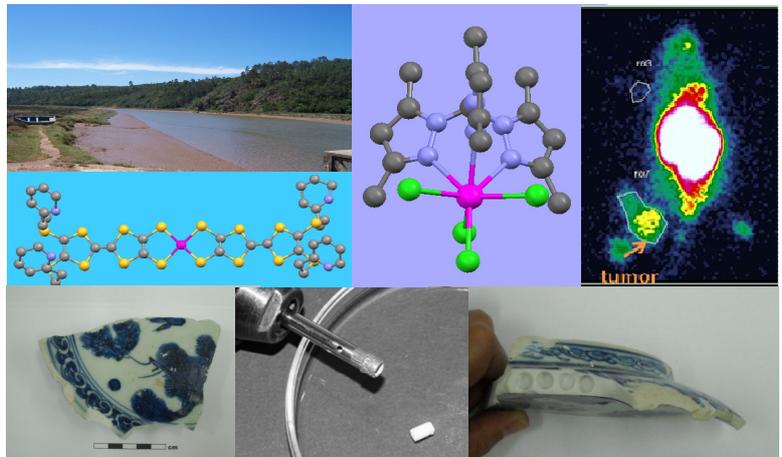


Chemical and Radiopharmaceutical Sciences Unit



Chemical and Radiopharmaceutical Sciences

Joaquim Marçalo

The **Chemical and Radiopharmaceutical Sciences Unit** (CRSU) continued to expand its research activities in the development of new inactive and radioactive compounds with importance in **Health, Materials and Nuclear Sciences and Catalysis**, and in the application of nuclear-based and related analytical techniques in **Cultural Heritage and Environmental and Earth Sciences**. The activities were carried out by five research groups:

Applied Geochemistry & Luminescence on Cultural Heritage (GeoLuC) – centred in the study of Portuguese cultural heritage materials and geo-environmental contexts using nuclear techniques and geochemistry and mineralogy methodologies. INAA, XRD and luminescence (TL and OSL) were employed in archaeometry, environmental geology and palaeoenvironmental reconstruction investigations. Dating and authenticity studies and materials characterization of Portuguese faience and Chinese porcelain from the Portuguese market (XVI to XVIII centuries) were a focus of the work.

Environmental and Analytical Chemistry – devoted to fundamental and methodological research in elemental and isotopic analysis as applied to environmental geochemistry, isotope hydrology, oceanography and archaeometry. ED-XRF, light isotope MS, HPLC-ICP/QMS, C-14 dating and H-3 determinations were used in sedimentary geochemistry, geochronology, absolute dating, palaeoecology, meteorology, water resources, and archaeometallurgical studies. Research centred on the palaeoenvironmental reconstruction of the Minho and Douro drainage basins and the assessment of ecological effects of metals on Sado tidal marshes.

Inorganic and Organometallic Chemistry – dedicated to the investigation of actinide and lanthanide compounds. Synthesis, reactivity and catalytic studies were performed and advanced MS and calorimetry techniques were used to correlate electronic structures and chemical properties of the compounds. Of note was an assessment of the gas-

phase energetics of neutral and singly and doubly charged cationic actinide monoxides and dioxides from thorium to curium, leading to a consistent set of metal-oxygen bond dissociation enthalpies, ionization energies, and enthalpies of formation.

Radiopharmaceutical Sciences – committed to basic/applied-oriented research and technology transfer on nuclear tools for SPECT and PET molecular imaging and targeted radiotherapy. The multidisciplinary work involved innovative organic and coordination chemistry, bioconjugation, radiochemistry, animal and cell studies and molecular biology. The design and synthesis of novel ^{99m}Tc(I) receptor-targeted polymeric nanoprobe, based on dextran-mannose conjugate derivatives, for sentinel lymph node detection by nuclear imaging was a highlight of the work

Solid State – involved in the study of selected new materials with unconventional electrical and magnetic properties. Expertise on the synthesis of molecule-based materials and f-element intermetallic compounds was combined with a variety of specialized solid state physics techniques. Noteworthy was the development of new multifunctional hybrid molecular materials based on cationic Fe(III) complexes with FeN₄O₂ coordination and Ni bisdithiolate anionic complexes, and displaying coexistence or synergism of spin crossover with magnetism or electrical conductivity.

In 2009, renovation of some of the CRSU **facilities**, namely the HVAC system of the main building and a few laboratories, was undertaken. The CRSU maintained its practice of high level **training** of young scientists at the MSc, PhD and Post-doc levels, and of advanced **education** activities in collaboration with the universities. National and international **projects**, mainly coordinated by the CRSU and financed by the FCT, the EC and a pharmaceutical corporation, progressed. Additional funding was obtained through protocols, contracts and services with different institutions and companies.

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