

Chemistry Sector



Outside view of Building for Cryogenic Techniques

Chemistry

Maria de Fátima Araújo

Fundamental and applied research are conducted in specific areas of expertise, consisting on the development on the **synthesis of inactive and radioactive compounds** dedicated to the progress of **health, materials sciences and catalysis**, and the use of **nuclear based and related methods to environment, earth sciences and cultural heritage**. Research activities are grouped in five areas:

Solid State – the group centre its research activity on selected new materials with unconventional electrical and magnetic properties. Strong skills combining preparative chemistry expertise with specialized solid state physics enable the team to deal with different problems of modern materials science. Activities were centred in selected materials namely: molecular based conducting and magnetic materials and intermetallic compounds with *f*-elements.

Inorganic and Organometallic Chemistry – Research activities are focuses on the synthesis, characterization, chemical reactivity and energetics of 4f and 5f element compounds and in gas-phase ion chemistry studies of highly radioactive actinides by FTICR/MS. IOC team has been involved in environmental studies, particularly the vitrification of radioactive wastes containing actinides and, in collaboration with the Radiation Technologies group (Physics), in gamma radiation effects on waste water sources. Of importance is also a new collaboration with OMNIDEA, Lda., a start-up company dedicated to R&D of aerospace technology and energy systems.

Inorganic and Radiopharmaceutical Chemistry – Research in modern Radiopharmaceutical Chemistry is dedicated to find innovative radioactive tools for molecular imaging and/or targeted radiotherapy with interest for Nuclear Medicine. To achieve this goal IRC team develops and implements expertise on organic, inorganic and organometallic chemistry of d- and f-elements, radiochemistry, radiopharmacy, cell and animal studies and biochemistry. IRC expertise and infrastructures justify the support of an international pharmaceutical company and funding from CIMAGO/FLAD.

Environment and Analytical Chemistry – multidisciplinary team supported by high specialized

methodologies - EDXRF, Mass-Spectrometry for Light Isotopes, and Radiocarbon and Tritium dating – applied to Environmental Geochemistry, Isotope Hydrology, Oceanography and Archaeometry. Research aims at the understanding of the recent and palaeo-evolution of natural coastal environments: ground water systems, rivers, lagoons, estuaries and continental shelf. Archaeometallurgical studies aim at the characterization of Pre and Protohistoric metal production, circulation and consumption in Portugal.

Cultural Heritage and Sciences – The group is especially devoted to the study of cultural assets and corresponding environment contexts, through the application of nuclear methods of chemical analysis and absolute dating. The main research domains comprise luminescence dating of archaeological and geological contexts, archaeometry of ceramic, metal and lithic materials, and geochemistry and mineralogy of the earth surface. Development of luminescence techniques has been done for ceramic art objects authenticity and production technologies

National and international projects with the scientific coordination and/or participation of Chemistry researchers have been running. Some laboratories were moved into a recently renovated building allowing new laboratories to be installed including a clean and a gamma-spectrometer laboratories under the program for new infrastructures and equipment financed by the National Scientific Infrastructure Programme were implemented (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.

Education and training of Undergraduate, MSc, PhD and Post-doc students is one of the most important achievements at Chemistry, as well as an active participation of Researchers in advanced training activities in collaboration with Universities and in the framework of international networks.

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Chemistry Staff

Researchers

A.P. MATOS, Coord.
A.M.M. SOARES,
Princ.
A. GONÇALVES,
Princ.
A.M.R. PAULO,
Princ..
I.R. SANTOS, Princ.
J.C.
WAERENBORGH,
Princ.

J.G. CORREIA, Princ.
J. MARÇALO, Princ.
M.F. ARAÚJO, Princ.
M.L. ALMEIDA,
Princ.
M.I. PRUDÊNCIO,
Princ.
N. MARQUES, Princ.
V.P. GAMA, Princ.
E.B. LOPES, Aux.
F.M. MARQUES,
Aux.
I.C. SANTOS, Aux.

J.P. LEAL, Aux.
J. BRANCO, Aux.
J.M. CARRETAS,
Aux.
L. PERREIRA, Aux.
M.C. SILVA, Aux.
M.I. DIAS, Invited
Aux.
M.L. GANO, Aux.
M.P. CAMPELO,
Aux.
M.T. ALMEIDA, Aux.

P.D. RAPOSINHO,
Aux.
P.M. CARREIRA,
Aux.
C.M. FERNANDES,
Assistant

Administrative and Techn. Personnel

A. CRUZ
A. RODRIGUES
A.J. AMARO

A.J. SOARES
D. ANDRÉ
E. CORREIA
I. FRAZÃO
L. FERNANDES
M.F. MARQUES
M.F. CABRITA
M. CORREIA
O. MARGO
P.M. REIS
P. VALÉRIO