



PhD in SCIENZE E TECNOLOGIE ENERGETICHE E NUCLEARI / ENERGY AND NUCLEAR SCIENCE AND TECHNOLOGY - 40th cycle

THEMATIC Research Field: RADIOCHEMISTRY AND RADIATION CHEMISTRY FOR NUCLEAR DECOMMISSIONING AND WASTE MANAGEMENT

Monthly net income of PhDscholarship (max 36 months)

€ 1500.0

In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity

Motivation and objectives of the research in this field

The nuclear industries and technologies are continuously evolving in a perspective of reliable, safe, sustainable, and transparent development. In particular, there is need for innovation and research for ensuring the safe implementation of NPP and ND&WM (Nuclear Power Plants and Decommissioning & Waste Management both for radioactive and/or contaminated matrixes), as clearly demanded by the industry and the scientific community. This research addresses current environmental and safety issues arising from the production of energy by nuclear fission and the industrial exploitation of ionizing radiation. In particular, the main research lines are:

1. hydrometallurgical advanced reprocessing for separating actinides and fission products from spent nuclear fuel.
2. new solid matrices for radioactive waste confinement.
3. radiation damage on organic systems for reprocessing and inorganic matrices for confinement.
4. radio-induced modifications on materials for radiation processing; dosimetric systems for medical applications; food irradiation.
5. new treatment processes for industrial and radioactive waste



	<p>6. advanced radiochemical methods for radioactive contaminants and hard-to-measure radionuclides determination</p>
<p>Methods and techniques that will be developed and used to carry out the research</p>	<ol style="list-style-type: none"> 1. Solvent extraction for actinide/lanthanide/fission products separation. Nuclear measurements and analytical/radioanalytical techniques (ICP-MS, ICP-OES, LSC, UV-VIS, NMR, ESI-MS etc.) for fuel partitioning studies. 2. Raman spectroscopy, X-ray fluorescence and diffraction, SEM, tomography, mechanical-thermal-irradiation-leaching resistance tests for characterization of waste confinement matrices. 3. gamma-irradiation, HPLC, MS, NMR and EPR spectroscopy for radiolytic products characterization. 4. GPC, PALS, FT-IR and EPR for materials study, UV-VIS and MRI for absorbed dose measurement. 5. FT-IR, Raman XRD, XRF, SEM, TGA, GC-MS, ICP-MS, ICP-OES, etc. for the characterization of treatment processes. 6. Radiochemical methods for Nucl. Decommissioning, incl. Nuclear measurements techniques (alpha/gamma spectrometry, LSC, ICP-MS etc.) <p>In addition, computational tools may be employed for complementing the experimental data (e.g. Monte Carlo and Density Functional Theory).</p>
<p>Educational objectives</p>	<p>To gain a cutting-edge know-how from the viewpoints of radiochemistry, radiation chemistry and nuclear waste management in the abovementioned research and technological fields. To develop experimental and computational research to tackle multidisciplinary and complex issues, taking advantages from the new nuclear laboratories, equipment, facilities and the strong experimental background of the research group. To develop critical thinking and collaborate with companies and research organizations within national and international contexts (EURATOM/H2020, IAEA, JPNM-</p>



	EERA, ENEN2Plus Collaborative Projects and Industrial Contracts).
Job opportunities	In the field of nuclear and chemical activities for energy production and Gen IV systems; national and European industries involved in nuclear power plants activities/controls, nuclear decommissioning, management and disposal of nuclear and industrial radioactive/contaminated waste; International Research Centres, ...
Composition of the research group	1 Full Professors 0 Associated Professors 2 Assistant Professors 3 PhD Students
Name of the research directors	Mario Mariani, Elena Macerata, Eros Mossini

Contacts

mario.mariani@polimi.it
 eros.mossini@polimi.it
 elena.macerata@polimi.it
 +39 02 2399-6358 (-6395)
<http://www.radiochimica.polimi.it>
<https://www.youtube.com/channel/UCKh-HxSAWYhhNX076uuvTOA/videos>

Additional support - Financial aid per PhD student per year (gross amount)

Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad

Amount monthly	750.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Collaborations with Universities, Companies, Agencies and/or National or International Institutions having interests on the research field: IAEA; CEA - Commissariat à l'Energie Atomique (France); SCK CEN (Belgium); JRC-EC; KIT (Germany); Chalmers (Sweden); IMT Atlantique (France); SoGIN Group; ENI; ANSALDO NUCLEARE ...
 Financial aid per PhD student is available for purchase of study books and material, funding for participation in courses, summer schools, workshops and conferences, instrumentations and



computer, etc. According to R&D funding availability, this amount is around 10% of the annual gross amount, for 3 years.

Availability of funding in recognition of supporting teaching activities by the PhD student. There are various forms of financial aid for supporting activities to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations. Awards will be recognized to the PhD candidate up to Euro 2.000,00 (gross amount) per year, in case of exceptional achievements in the research project (modelling tools, scientific papers, etc.), subject to the evaluation of the research directors.