



# PhD in SCIENZE E TECNOLOGIE ENERGETICHE E NUCLEARI / ENERGY AND NUCLEAR SCIENCE AND TECHNOLOGY - 39th cycle

**THEMATIC Research Field: ADVANCED SEPARATION PROCESSES AND INNOVATIVE METHODS FOR THE TREATMENT, DECONTAMINATION AND CONFINEMENT OF RADIOACTIVE WASTES**

**Monthly net income of PhDscholarship (max 36 months)**

**€ 1300.0**

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 research addresses current environmental and security 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. fuel-coolant chemical interactions and corrosion phenomena in Gen IV nuclear systems. 3. new solid matrices for nuclear waste confinement. 4. radiation damage on organic systems for reprocessing and inorganic matrices for confinement. 5. radio-induced modifications on materials for radiation processing; dosimetric systems for medical applications; food irradiation. 6. Nuclear Decommissioning 7. treatment processes for nuclear waste 8. advanced radiochemical methods for hard-to-measure radionuclides

**Methods and techniques that will be developed and used to carry out the research**

1. Solvent extraction for actinide/lanthanide/fission products separation. Nuclear measurements and analytical chemistry techniques (ICP-MS, UV-VIS, NMR, ESI-MS etc.) for fuel partitioning studies. 2. Raman scattering, X-ray fluorescence and diffraction, SEM, mechanical and leaching resistance tests for characterization of waste confinement matrices. 3. g-irradiation, HPLC, MS, NMR and EPR spectroscopy for



	irradiation, HPLC, MS, NMR and EPR spectroscopy for radiolytic products characterization. 4. GPC, PALS, FT-IR and EPR for materials studies. 5. UV-VIS and MRI for absorbed dose measurement. 6. Radiochemical methods for Nucl. Decommissioning, incl. Nuclear measurements techniques (alpha spectrometry, LSC, ICP-MS etc.) 7. Monte Carlo codes for radiation or matter transport. 8. Density Functional Theory simulations for Gen IV studies
<b>Educational objectives</b>	To gain a cutting-edge know-how from the viewpoints of radiochemistry, radiation chemistry and nuclear waste management in the abovementioned research fields. To develop experimental and computational research to tackle multidisciplinary and complex issues, taking advantages from the new nuclear laboratories and the strong experimental background of the research group. To collaborate within international contexts (EURATOM/H2020, IAEA, JPNM-EERA Collaborative Projects).
<b>Job opportunities</b>	In the field of nuclear and chemical activities for energy production and Gen IV systems; national and European industries involved in nuclear decommissioning, management and disposal of nuclear and industrial waste; International Research Centres.
<b>Composition of the research group</b>	1 Full Professors 1 Associated Professors 2 Assistant Professors 2 PhD Students
<b>Name of the research directors</b>	Mario Mariani, Elena Macerata, Eros Mossini

<b>Contacts</b>	
mario.mariani@polimi.it; +39 02 2399 6358 (6395) <a href="http://www.radiochimica.polimi.it">http://www.radiochimica.polimi.it</a> <a href="https://www.youtube.com/channel/UCKh-HxSAWYhhNX076uuvTOA/videos">https://www.youtube.com/channel/UCKh-HxSAWYhhNX076uuvTOA/videos</a>	

<b>Additional support - Financial aid per PhD student per year (gross amount)</b>	
<b>Housing - Foreign Students</b>	--
<b>Housing - Out-of-town residents (more than 80Km out of Milano)</b>	--



Scholarship Increase for a period abroad	
Amount monthly	650.0 €
By number of months	6

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

Educational activities supported by purchase of study books and material, funding for participation in courses, summer schools, workshops and conferences according to the R&D needs and opportunities Teaching assistantship by means of availability of funding in recognition of supporting teaching activities by the PhD student. There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.