



PhD in INGEGNERIA MECCANICA / MECHANICAL ENGINEERING - 39th cycle

THEMATIC Research Field: FROM SCRAP TO ULTRACLEAN ALLOY

Monthly net income of PhDscholarship (max 36 months)

€ 1400.0

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

All the industrial sectors show such a constant demand for innovative materials and processes and a consolidated availability to new solutions. The increasingly stringent performance requirements, the use of new materials and the application of technologically advanced production processes cannot disregard the need to more performant material free of as much as possible defects. The shortage of raw materials and the need of environmental impact reduction led to the search of new solutions in the recycle of metallic material turn out in the increase in the product quality, reducing the production footprint. This research aims at implementing new processes and operational practice in a vision matching the requirements of the circular economy and energetic improvement.

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

Materials characterization of the raw materials and the final products, in relation to the microstructure and the mechanical properties and the corrosion resistance. Metallurgical techniques for metal production, casting, plastic deformation and heat treatment to assess the best properties. The recycle of metallic materials in laboratory furnace, the subsequent deformations and heat treatments will be simulated. Standard tensile test, fatigue test and fracture mechanics test will be performed to obtain the mechanical properties. Standard metallographic techniques, SEM-EBSD, XRD and DSC analysis will be performed for the material and defect characterization. Potentiodynamic test (EPR and EIS) for the corrosion characterization. Also LCA (life cycle



	assessment) will be performed in order to evaluate the process improvement impact.
Educational objectives	At the end of this project the PhD candidate will be able to analyse several kinds of technological problems and choose the best solution for them. In particular, the candidate will gain deep technical knowledge on metal production and on the environmental impact reduction technologies. The candidate will also learn how to manage the data obtained in the laboratory testing in order to conduct numerical analysis of metallurgical processes. Furthermore, individual soft skills such as research planning, teamworking and lateral thinking for problem solving will be developed during the research period.
Job opportunities	Our last survey on MeccPhD Doctorates highlighted a 100% employment rate within the first year and a 35% higher salary , compared to Master of Science holders in the same field.
Composition of the research group	1 Full Professors 4 Associated Professors 0 Assistant Professors 3 PhD Students
Name of the research directors	Prof. Carlo Mapelli, Prof. Silvia Barella

Contacts
<i>E-mail:</i> carlo.mapelli@polimi.it; silvia.barella@polimi.it
For questions about scholarship support phd-dmec@polimi.it

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	700.0 €
By number of months	6



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

Financial aid is available for all PhD candidates (purchase of study books and materials, funding for participation in courses, summer schools, workshops and conferences) for a total amount of euro 5.707,13.

Our candidates are strongly encouraged to spend a research period abroad, joining high-level research groups in the specific PhD research topic, selected in agreement with the Supervisor. An increase in the scholarship will be applied for periods up to 6 months (approx. 700 euro/month - net amount).

Teaching assistantship: availability of funding in recognition of supporting teaching activities by the PhD candidate. 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.