

**PhD SCHOLARSHIP 2018 DATASHEET**

Business Division Business Area	Industry and Transport Iron and Steel
Technology Platform	Iron
Scholarship location Province Building	Gipuzkoa Mikeletegi 2
Co-Director of Thesis (Tecnalia)	Pedro Egizabal

**SCHOLARSHIP DESCRIPTION**

**Scholarship title: Modelling of the behaviour of nanometric ceramic particles in aluminium alloys in liquid state and their influence on properties**

**Brief description of scholarship:**

The purpose of the scholarship is to develop mathematical models that can predict the behaviour and effect of nanometric ceramic particles in an aluminium matrix. The results will be compared with the analysis of the micro-structure of specimens obtained by casting and the correlation between the properties and the micro-structure of the material will be sought. The final purpose is to develop a tool based on simulation models that helps in the selection and optimisation of the addition of particles in cast aluminium to make the most of the possibilities of nano-reinforcements and reduce the number of tests in the pilot plant.

**Detailed description of scholarship:**

The work falls under the line of development of materials made up of a nano-reinforced aluminium matrix from the Tecnalia casting platform in which a series of projects are in progress.

The nanometric scale of the reinforcements theoretically provides significant increases in the mechanical properties of the aluminium alloys. However, the hardening mechanisms and the relationship between the micro-structure and the final properties and features of this family of materials are not yet clear. The laboratory work is hindered by the current technical barriers to achieve a homogeneous dispersion of the nanoparticles and the difficulty of their observation by conventional techniques of micro-structural characterisation. Therefore, other tools, such as modelling, are required.

The proposed work seeks to develop models that predict the behaviour of the nanoparticles under different conditions of the process (under the effect of ultrasonic waves, agitation by induction, mechanical agitation, temperature of the cast aluminium, morphology and chemical nature of the nanoparticles, etc.) and the mechanical properties of the nano-reinforced material are predicted.

**REQUIREMENTS:**

The PhD candidate shall meet the following requirements:

- **Degree and specialisation:** Engineering - Industrial or Metallurgical
- **Languages:** English, Basque, Spanish French and German will be a plus
- **IT skills:** Modelling tools, programming
- **The following will be a plus:** Knowledge of material sciences. Master's degree on industrial technologies.

**Further information and applications:** <http://bit.ly/2qB7g8O>

**INTERNAL INFORMATION:**

University where the Doctorate will be carried out	Tecnun. University of Navarre
University Doctorate Programme in which the selected candidate should be registered.	Undefined
Thesis Director in the University	Undefined
Stays	Possibility of a 1-month stay at a foreign university (Poland)

**PROJECTS: IZADI, NANOTRAN? GOLIATH? OASIS?**

**PRELIMINARY MILESTONE PLAN:**

**1ST YEAR**

Acquire the theoretical and practical knowledge of casting and nanomaterial processes. Define the scope of the project: materials, simulation tools, properties to be simulated, definition of the test plan.

**2ND YEAR**

Test plan 70% completed. Simple models completed.

**3RD YEAR**

Completion of the experimental part. 80% development of the simulation model.

**4TH YEAR**

Final adjustment of the model. Drafting of the doctorate thesis and presentation.