

PhD SCHOLARSHIP 2018 DATASHEET

Business Division Business Area	Industry and Transport Aerospace
Technology Platform	Manufacturing processes of structures using composites
<u>Scholarship location</u> Province Building	Parque tecnológico Gipuzkoa Paseo Mikeletegi, 2 (Donostia-san Sebastian)

SCHOLARSHIP DESCRIPTION

Scholarship title: Development of new high-performance PUR resin formulations for structural components high production rate processes

Brief description of scholarship:

This scholarship intends to develop new PUR system formulations for RTM processes, enabling manufacturing structural composites for the automotive sector with faster production rates and improved properties (impact resistance, durability).

Work will be undertaken in the field of synthesis of new resin formulations, as well as design and development of manufacturing processes of structural components with those formulations. The matters covers will include: from analysis, synthesis and characterisation of resins, to simulation and optimisation of manufacturing processes.

Detailed description of scholarship:

Thanks to their low density and excellent strength to weight-ratio, composites are the materials with the highest weight reduction potential to achieve lighter structures and therefore reduce CO₂ emissions of cars. However, the use of these materials for light-weight solutions on the automotive market is still budding due to the production cost of these components and reduced production capacity/long processing times of the current manufacturing technology.

As a result, automotive manufacturers, alongside resin producers, are working to develop more reactive materials and processes which enable increasing production rates while reducing processing times to just a few minutes, such as: High Pressure-RTM (HP RTM) and High Pressure Compression-RTM (HP CRTM). Regarding RTM resins in particular, ultra-fast curing (2-5 min) and

low viscosity formulations are required to maximise the optimisation of curing and injection cycles. Epoxy resins which are currently used compete with thermoplastic composites and polyurethanes in this race.

Compared to other alternatives, Polyurethane (PUR) resin based technology offers the advantage of high tenacity and fatigue strength properties, which make them particularly attractive for components subject to impact or to cyclic loads such as suspension components. Nevertheless, the main use of thermosetting PURs was traditionally focused on low performance applications and projection processes, R-RIM, S-RIM or casting. As a result, their application to structural components has not been immediate.

This scholarship intends to develop new PUR formulations specific for RTM processes, facilitating the manufacture of high-performance structural components with high production rates at low costs.

For this, the following work will be carried out:

- Definition of technical requirements; analysis of commercial systems; and synthesis of new PUR formulations;
- Characterisation and modelling of systems developed for manufacturing process simulation purposes; and
- Design and fine-tuning the manufacturing process of structural components with the new formulations developed.

The PhD candidate shall meet the following requirements:

- **Degree and specialisation:** Degree in Chemical Engineering; Degree in Chemistry; or Degree in Industrial Chemical Engineering
- **Languages:** Intermediate-advanced level of English
- **IT skills:** Labview or similar, intermediate level
- **The following will be a plus:** previous knowledge of synthesis, characterisation and manufacturing processes of composites

More information and applications: <http://bit.ly/2qD1qUB>