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## ESR-4 JOB VACANCY

### Position description

Reference:	<b>ESR-4</b>		
Title:	Processing and mechanical characterization of recyclable vitrimer composites for automotive applications		
Hiring beneficiary:	<b>UGent-MMS</b>		
Location:	Ghent University (UGent), Ghent, Belgium.		
Start date:	01 October 2020	Duration:	36 months
Expected date of communication of results:	Less than 2 months after the application submission		

### Job description

Objective:	<p>Vitrimers are a groundbreaking development in polymer chemistry. This new class of polymers is neither thermoset, nor thermoplastic, but inherits properties from both polymer classes. Vitrimers were "invented" by Prof. Leibler in Paris in 2011 (<a href="https://en.wikipedia.org/wiki/Vitrimers">https://en.wikipedia.org/wiki/Vitrimers</a>).</p> <p>Many applications can be imagined, but the application of vitrimers as the polymer matrix in fibre-reinforced composites, is particularly attractive, because the recycling of fibre-reinforced composites could be drastically improved.</p> <p>The objectives for the PhD researcher ESR4 are: Apply state-of-the-art methodologies to elaborate and perform in-depth characterization of epoxy-based glass- and carbon-fibre-reinforced vitrimer composites (FRVCs) involving transesterification exchanges. This will include: 1 – Lab-scale production of FRVCs without defects, voids or delaminations using RTM, infusion methods or compression moulding/thermoforming; 2 – Mechanical characterization (elasticity, yield stress, failure strength, fracture toughness, temperature-dependent behaviour) and characterization of the reinforcement/vitrimer matrix interface bonding strength; 3 – Mechanical characterization of static (nonlinear) behaviour, delamination resistance, creep, fracture toughness and residual properties after reshaping or recycling steps (e.g. shredding and further compression moulding); and 4 – Characterization of properties related to automotive applications (ageing, high speed impact, fatigue, electrical properties).</p>
Expected results:	<p>The PhD researcher ESR4 will develop fast cure of epoxy vitrimers compliant with the existing technology of fibre-reinforced epoxy composites processing. ESR4 will elaborate and perform mechanical characterization of FRVCs combining continuous or short glass or carbon fibres and epoxy vitrimers based on transesterification, quantify and rank their performances compared to benchmark thermoset and thermoplastic composites before and after several thermoforming or recycling steps. ESR4 will evaluate their ability to extend their service life thanks to their self-healing and welding ability. ESR4 will also study their recycling (by e.g. shredding and compression moulding). Development of new epoxy-based vitrimers permits to take advantage of the existing</p>

	<p>technological environment: equipment, resin, fibre-sizing, already optimized for epoxy composites and the vast portfolio of epoxy hardeners and accelerators. Based on their performances best FRVCs will be considered in the automotive sector as lightweight recyclable parts for structural applications (e.g. boot lids, chassis, hang-on, doors, or body in white parts, intrusion beams, parts of the hood, bumper parts), and as parts for high pressure gas tanks, or for hydrogen tanks and electrical engines of electrically powered vehicles.</p>
Supervisors:	<p>Prof. W. Van Paepegem Dr. I. Christiaens</p>
Secondments (short term academic and industrial internships):	<p>S1 to <b>ESPCI</b> (Paris, France) – 2 months – training in epoxy-vitrimer chemistry to reach curing parameters compatible with composites processing S2 to <b>TU/e</b> (Eindhoven, Netherlands) – 1 month – experiment-based model refinement and validation for FRVCs S3 to <b>Renault</b> (Guyancourt, France) – 3 months – application of FRVCs as recyclable/repairable structural parts in the automotive industry</p>

Vacancy requirements	
Qualifications:	<p>Not having resided in Belgium for more than <b>12 months in the 3 years</b> immediately before the recruitment date, and <b>not having carried out their main activity</b> (work, studies, etc.) in Belgium during this period.</p> <p>Having a master degree or equivalent diploma (Master degree in Mechanical Engineering, Materials Science, Civil Engineering, (Applied) Physics), less than 4 years of research career at the recruitment date, and not having a doctoral degree.</p> <p>Solid background in mechanical characterization of materials and (fibre-reinforced) polymer properties.</p>
Languages:	<p>Good level in oral and written English is mandatory.</p> <p>Dutch language is optional. Courses can be offered through the doctorate school.</p>
Skills:	<p>Ability for project management, dissemination, communication with colleagues and supervisors and strong teamwork spirit.</p>
Experience:	<p>Having completed a research internship in academia or industry.</p>

## Job details

Gross salary:	The successful candidate will receive an attractive salary in accordance with the MSCA regulations for Early Stage Researchers (ESR). The exact (net) salary will be confirmed upon appointment and is dependent on local tax regulations and on the country correction factor (to allow for the difference in cost of living in different EU Member States). The minimum (net) salary per month is 2100 EUR (after taxes). The guaranteed PhD funding is for 36 months.
Other benefits:	In addition to their individual scientific projects, all ESR fellows will benefit from further continuing education, which includes internships and secondments, a variety of training modules as well as transferable skills courses and active participation in workshops and conferences.
Duration:	36 months
Starting date:	Ideally 01/10/2020
Type of contract:	Full time position
Hours per week	38 hours
Place of work:	Ghent University Mechanics of Materials and Structures Technologiepark-Zwijnaarde 46 "Materials Science" B-9052 Zwijnaarde Belgium <a href="http://www.composites.ugent.be">www.composites.ugent.be</a>
Local language:	Dutch

Application package is available on the Recruitment page of the VITRIMAT website  
<https://www.vitrimat.eu/Recruitment.html>