

**Scienza e Nanotecnologia dei Materiali**  
**Materials Science and Nanotechnology**

<b>Progetto di ricerca Research project</b>	“Performance and Durability of Li Batteries under Dynamic Operating Conditions” <b>(MAT.1)</b>
<b>Tipo/Type</b>	Borsa finanziata da CORIMAV – Pirelli S.p.A./Scholarship funded by CORIMAV – Pirelli S.p.A.
<b>Borse/Scholarships</b>	1
<b>Abstract</b>	<p>The demand for high-performance batteries capable of operating under dynamic conditions has intensified with the proliferation of this technology on the electric vehicles, application which also extends to other vehicle components. Battery integration into tyres is an emerging technology with many benefits for automotive industry., The battery enables the integration of sensors and electronics directly into tyres, monitoring the road conditions, tyre wear, vehicle performance, predictive maintenance and driving performance optimization with the creation of a cyber tyre. However, this battery operates in a complex and dynamic environment which impacts on battery performance metrics such as energy and power density, lifetime because to the gradual accumulation of the degradation factors that reduce battery performance and longevity over the time. Dynamic conditions, such us rapid acceleration, frequent braking, and varying loads, exacerbate this issue.</p> <p>The proposed PhD research activity aims to study recent advancements and challenges in developing batteries that exhibit superior performance and durability under fluctuating operating conditions.</p> <p>The candidate will explore innovative strategies across multiple functions, from electrode material structure, tailoring electrode materials to enhance thermal stability and mitigate mechanical stress and degradation mechanisms under dynamic conditions, improving battery performance and optimising cell design and architectures.</p> <p>This endeavor aspires to bridge the gap between academia and industry, offering pragmatic solutions to real-world challenges in power sources technology. Collaborative efforts with industry facilitate technology transfer and pave the way for scalable production of high-performance battery systems, thereby fostering innovation and driving the transition towards a sustainable energy future.</p>
<b>Tutor</b>	Tutor Unimib: Prof. Riccardo Ruffo , Prof. Piercarlo Mustarelli Tutor Pirelli: Dr. Antonio Susanna, Dr. Simone Vigna
<b>I.P.</b>	<i>Intellectual property clauses agreed with the Company apply to this scholarship</i>

<b>Scienza e Nanotecnologia dei Materiali</b> <b>Materials Science and Nanotechnology</b>	
<b>Progetto di ricerca</b> <b>Research project</b>	“Bio-inspired Elastomeric Nanocomposites Based on polypeptide derivatives” <b>(MAT.2)</b>
<b>Tipo/Type</b>	Borsa finanziata da CORIMAV – Pirelli S.p.A./Scholarship funded by CORIMAV – Pirelli S.p.A.
<b>Borse/Scholarships</b>	1
<b>Abstract</b>	<p>Biopolymer provide inspiration for the design of advanced materials.. Among the others biopolymers, proteins and derivatives represent smart tools for innovative solutions in many applications:</p> <p>Nevertheless the challenges of using proteins and polypeptides as structural materials are multifaceted : Engineering protein-based nanocomposite- through structural and chemical design- synthesis, purification, and processing - is the aim of this PHD research activity .</p> <p>The development of strategies for polypeptide derivatization and the relative application for novel hybrid rubber nanocomposites with improved mechanical properties has to be considered taking account of sustainability.</p> <p>Chemical Characterization via spectroscopic techniques for new derivatives, and physical properties for vulcanized rubber composite will be investigated .</p>
<b>Tutor</b>	Tutor Unimib: Prof. Barbara La Ferla Tutor Pirelli: Dr. Luisa Rossiello
<b>I.P.</b>	<i>Intellectual property clauses agreed with the Company apply to this scholarship</i>

<b>Scienza e Nanotecnologia dei Materiali</b> <b>Materials Science and Nanotechnology</b>	
<b>Progetto di ricerca</b> <b>Research project</b>	“Environmental aging and biodegradation of rubber compounds to match sustainability and circular economy targets in a tyre life cycle perspective” <b>(MAT.3)</b>
<b>Tipo/Type</b>	Borsa finanziata da CORIMAV – Pirelli S.p.A./Scholarship funded by CORIMAV – Pirelli S.p.A.
<b>Borse/Scholarships</b>	1
<b>Abstract</b>	<p>Very little is known today about the environmental fate of rubber compounds released in the environment during the “use phase” of tyres, i.e. in connection with tyre wear.</p> <p>The overarching ambitious goal of the proposed research is to contribute to the design of fully biobased and biodegradable compounds, thus fulfilling the “Circular Bioeconomy” paradigm, requiring that renewable resources are transformed into products that at the end of their life either fully return to Nature or can be further used as raw materials for new products.</p> <p>The proposed research activity is focused on i) the assessment of ultimate biodegradability of rubber compounds as a function of their formulation, morphology, processing and aging; ii) the characterization of the microbial community/ies capable of promoting rubber compounds biodegradation, and possible engineering for potentiating their properties; iii) the rational design of more environmentally friendly rubber composites of potential interest in tyre applications.</p> <p>The project will see a convergence of topics related to material science, microbial biotechnology and biobased processes. The research will include microbiological, molecular biology, biochemical and compounding activities with the final aim to formulate novel rubber-based compounds. Experimental work will be dedicated to the mechanical characterization of such compounds and to the assessment of their biodegradability, following standard methodologies as well as developing original ones appropriate to the final aim and scope.</p>
<b>Tutor</b>	Tutor Unimib: Prof. Paola Branduardi Tutor Pirelli: Dr. Silvia Guerra
<b>I.P.</b>	<i>Intellectual property clauses agreed with the Company apply to this scholarship</i>