



# PhD in INGEGNERIA DEI MATERIALI / MATERIALS ENGINEERING - 40th cycle

**PNRR 630 Research Field: IMPACT OF BINDER FEATURES AND ITS INTERACTIONS WITH  
INORGANIC MATERIALS ON THE PROPERTIES OF LI-ION BATTERY CATHODES AND  
SLURRIES**

<b>Monthly net income of PhDscholarship (max 36 months)</b>
<b>€ 1500.0</b>
In case of a change of the welfare rates during the three-year period, the amount could be modified.

<b>Context of the research activity</b>	
<p><b>Motivation and objectives of the research in this field</b></p>	<p>Lithium ion batteries are the key technology enabling the transition to clean mobility and will play a key role in energy storage for renewables. Syensqo has the ambition to be leader in this field when it comes to materials. This is already the case when looking at cathode binders (based on PVDF), where Syensqo is the leader on the market. To maintain this position in the future, PVDF performances will need to be pushed to the limit. To do so, it is fundamental to unravel the hidden correlations between binder properties and performance through the understanding of binder-system interactions. The aim of this study will be that of identifying the key interactions that affect binder performance to allow the development of the next generation of binders.</p>
<p><b>Methods and techniques that will be developed and used to carry out the research</b></p>	<p>The research activities will be mostly carried out in the R&amp;D centre of Syensqo in Bollate (MI). In this preliminary stage, the following techniques can be envisioned during the execution of the experimental activities: rheological studies on slurries (linear and non-linear rheology), mechanical tests on electrodes and polymeric films (tensile tests, peeling tests, flexibility tests, pull-off tests) electrical tests on electrodes (in-plane and through plane resistivity measurement), electrochemical tests on cells (e.g., impedance, cycling stability, C-rate tests), analytical tests on polymers or materials (DSC, TGA, NMR, XPS),</p>



	adsorption tests, QCM-D tests. Other tests could be performed depending on the needs arising during the research activities
<b>Educational objectives</b>	The student will develop strong competencies in the field of Li-ion batteries, combining both experimental and modeling work. Effective team-working and human interactions in research and industrial environments will be also pursued. Working in collaboration with Syensqo will provide a unique opportunity for experiencing an industrially-driven applied research.
<b>Job opportunities</b>	The PhD graduate, specializing in materials for Li-ion batteries, will acquire expertise in developing new materials for the energy transition and their characterization. Job opportunities for an expert PhD in this field are expected in both private and academic sectors, particularly suitable for R&D sectors.
<b>Composition of the research group</b>	1 Full Professors 2 Associated Professors 2 Assistant Professors 9 PhD Students
<b>Name of the research directors</b>	Prof. Gallo Stampino, Latorrata, Oriani, Cojocarù

<b>Contacts</b>	
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Web-pages of the research group: <a href="https://mat4en2.cmic.polimi.it">https://mat4en2.cmic.polimi.it</a>	

<b>Additional support - Financial aid per PhD student per year (gross amount)</b>	
<b>Housing - Foreign Students</b>	--
<b>Housing - Out-of-town residents (more than 80Km out of Milano)</b>	--

<b>Scholarship Increase for a period abroad</b>	
<b>Amount monthly</b>	750.0 €
<b>By number of months</b>	6



National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	Syensqo (Solvay) Viale Lombardia 20, Bollate (MI) <a href="https://www.syensqo.com">https://www.syensqo.com</a>
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	EWHA WOMANS UNIVERSITY 52 Ewhayeodae-gil, Seodaemun-gu, Seoul, Corea del Sud <a href="https://www.ewha.ac.kr/ewhaen/index.do">https://www.ewha.ac.kr/ewhaen/index.do</a>
By number of months abroad	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p><b>Confidentiality:</b> since this is a thematic scholarship, the management of Confidential Information, Results and their publication is subordinate to the restrictions agreed upon with the funding company. Upon acceptance of the scholarship, the beneficiary must sign a specific commitment.</p> <p><b>Individual budget for research</b> (tot. about 6.000 euro): 1st year: 2.000 euro; 2nd year: 2.000 euro; 3rd year: 2.000 euro;</p> <p><b>Teaching assistantship</b> (availability of funding in recognition of supporting teaching activities by the PhD student): there are various forms of financial 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 regulation.</p>