# MATERIALS SCIENCE AND TECHNOLOGY

## Ateneo - Advanced Electrode/Electrolyte Materials for Next-Generation Energy Storage

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| **Funded By** | Politecnico di TORINO [P.iva/CF:00518460019] |
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| **Context of the research activity** | Study and development of noval, advanced electrode/electrolyte materials for use in next-generation batteries that offer higher energy density, longer cycle life, and improved safety compared to current state-of-the-art materials. Optimization of manufacturing processes for battery components and materials, with a focus on scalability and cost-effectiveness, for the production of new battery architectures (Li-based and post-Li) that offer high performance and safety characteristics. Advanced characterization/modelling of the above materials and devices. |
| **Objectives** | Energy storage is essential for our future society, particularly due to concerns over global warming and related issues arising from over-dependence on oil-based energy production and use by industries. In the quest for a sustainable society, energy storage technology is vital and considered to play a central role in the future energy landscape. Rechargeable batteries of all forms will be required to follow this path, particularly coupled with renewable energy production.<br>Currently, the European Commission is proposing to modernize EU legislation on batteries, with actions announced in the new Circular Economy Action Plan. Batteries that are more sustainable throughout their life cycle are key to achieving the goals of the European Green Deal and contributing to the zero-pollution ambition set in it. They promote competitive sustainability and are necessary for green transport, clean energy, and achieving climate neutrality by 2050.<br>In such a scenario, the development of novel, advanced energy storage materials and devices based on abundant, cheap, and high-performing materials is needed to be integrated into a sustainable energy exploitation strategy of renewable sources. Batteries such as Li-ion batteries and post-Li energy storage systems are the most suited choices. However, safety remains an essential requirement, and problems related to the use of liquid electrolytes based on organic solvents (flammable, volatile, toxic) still need to be addressed. Among others, solid-state (polymer-based, hybrid, composite) electrolytes represent a truly suited option in this respect, and their development is fundamental for the future generation of safe, high- |

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| | performing energy storage and conversion devices, along with the electrode production by sustainable processes. |

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| **Skills and competencies for the development of the activity** | Candidates with education in Chemistry or Materials Science are sought. Candidates should have a solid chemistry and/or materials preparation background and high motivation to learn through advanced research.<br>Good knowledge of practical attitude for the laboratory activities and problem-solving skills are appreciated.<br>A background in characterization techniques and modelling of functional materials, and/or a background in electrochemistry and electrochemical characterization techniques, such as cyclic voltammetry and impedance spectroscopy, is also welcome. |