PhD in Materials Science and Technology

Research Title:

Electro-chemistry and new cell technologies

Funded by	SILK - FAW

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Context of the research activity	Despite the pandemic, **Europe continues to be a battery hotspot**, closing the investment gap to our major Asian competitors, and in moving fast towards its **open strategic autonomy** in this critical sector. In this context, let me highlight that **almost 70 industrial projects** are being supported by the Alliance, while expected to create 3 to 4 million jobs by 2025. Many of the battery investments have recently **advanced their timelines and raised their expected output capacity**." These are the words of Vice-President Šefčovič at the press conference following the 5th high-level meeting of the European Battery Alliance. To improve both the safety and the specific and volumetric energy density, together with good power performance new solid-state cells can be a good solution. Some issues need to be overcome as cycle life, production in big cell size and cyclability at room temperature. The use of suitable polymer and ceramic/polymer hybrid electrolytes makes the use of metallic lithium possible, with so increasing the whole cell energy density

Objectives	• **New solid state electrolyte materials:** polymer based electrolyte will be produced on graphite based anodes; ceramic/polymer based electrolyte will be produced on metallic lithium anodes • **Self-healing electrolytes**: in order to improve the cyclability of cells, new self healing functionalities can be added to polymer electrolytes. This is well in line with Battery2030 initiative • **Cell production processes and manufacturing** are of great importance to improve the full battery performance. The produced and commercial materials will be used to manufacture pre-industrial cells on a pilot line

Skills and competencies for the development of the activity	• Chemistry, electrochemistry, materials science, chemical/energy engineering