Strategic projects started in 2021

ELECTROCOFS

Molecular Design of Electrically Conductive Covalent Organic Frameworks as Efficient Electrodes for Lithium-Ion Batteries

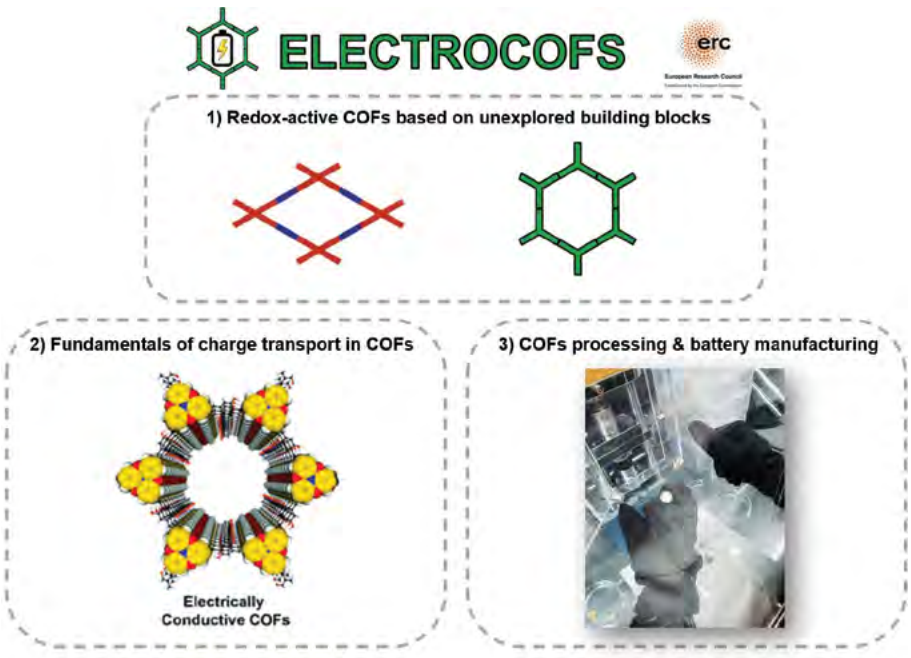
The European Research Council (ERC) has awarded Manuel Souto, researcher at CICECO-Aveiro Institute of Materials and Assistant Professor at the Department of Chemistry of the University of Aveiro, a highly prestigious Starting Grant (ERC-StG) worth 1.5 million euros. The ERC project ELECTROCOFS aims at exploring a new generation of porous organic polymers, known as Covalent Organic Frameworks (COFs), to be used as electrodes in lithium batteries.

Organic materials have received much attention as alternative electrodes because of their high theoretical capacity, resources availability and sustainability. In particular, organic porous materials such as COFs have emerged in the past few years as promising organic electrode materials due to their high stability, high ionic conductivity and outstanding chemical and structural versatility. In addition, their properties can be predicted by computational modelling allowing chemical design through theoretical calculations.

One of the advantages of these materials is their great versatility, because their physical properties can be modulated *à la carte* by chemical design. The choice of the organic building blocks (considered as Lego pieces) and the way in which they are joined together are decisive in the final properties of the resulting materials. This will be one of the major challenges to achieve an optimal balance between some key electrode parameters, such as capacity and stability.

Another major project challenge is to increase COFs electrical conductivity, as this is the main bottleneck for certain applications. An important goal of the project is to further understand at the fundamental level the charge transport in these materials, so the project will also have a major impact on other fields, such as optoelectronics, and on the development of other energy storage devices, besides lithium batteries.

Another important objective is to optimize COFs processing, in order to increase the performance of the batteries. Thus, the ultimate goal of ELECTROCOFS project will be to manufacture and test lithium batteries using conductive COFs electrode materials, assessing the influence of the processing techniques on the electrochemical performance.



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More information
www.electromolmat.com/projects/electrocofs