CONTRATOS PREDOCTORALES 2021 SEVERO OCHOA

PROJECT TITLE / JOB POSITION TITLE:

Controlling the composition and architecture of deposited products in metal-air batteries

RESEARCH PROJECT / RESEARCH GROUP DESCRIPTION:
(2.000 characters – including spaces)

Metal/air batteries could allow 3-5 times the specific energy of current Li-ion batteries at a lower cost, making an ideal choice for electric vehicles. However, their durability is often limited, and the mechanisms that lead to their failure are generally poorly understood.
The research line lead by Dr. Dino Tonti aims to contribute to this rationalization and improve performance by combining new materials and advanced characterization.

The present work will be supported by the collaboration with Dr. Andrea Sorrentino, beamline scientist at the Synchrotron ALBA, where part of the experiments will be designed and carried out.

Dr. Dino Tonti is a chemist, staff scientist at ICMAB. He has worked on surface science and optical techniques, synthesis of colloidal nanoparticles, carbons and battery materials. He is currently involved in metal-air batteries within several topics: development of novel electrode architectures, study of electrolyte additives, and characterization of electrochemical processes by analysis of discharge products and in situ monitoring.

Dr. Andrea Sorrentino is scientist at MISTRAL, ALBA's transmission soft X-ray microscopy beamline. His current research interests focus on the study of samples using different techniques: cryo transmission tomography, X-ray magnetic circular dichroism and spectromicroscopy, the latter in particular on battery materials.

JOB POSITION DESCRIPTION:
(2.000 characters – including spaces)
Include all the relevant information about the position, role, responsibilities and skills required within the project/group

All battery components have strong influence on the performance, however in metal-air batteries the interplay between the design of both electrodes, the operating conditions and the electrolyte composition is extraordinarily complex and leads to a wide range of performances. A key factor to understand the reaction mechanism and to control rechargeability is the composition and morphology of the products deposited on both electrodes during the discharge and charge processes. Combining lab- and synchrotron-based methods, this work will study these precipitates, and relate them to several factors such as the electrode texture, the presence of solid or soluble catalysts or other additives in the electrolyte able to control the stability of reaction intermediates. This information will help to

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minimize formation of side products, and produce precipitate architectures that promote the most efficient removal.

The student will participate to the development of more efficient metal/air batteries using different anodes and electrolytes. In particular he/she will:

- Process functionalized binder-free electrodes
- Investigate their electrochemical behavior in batteries.
- Investigate the electrode and cell materials before, during and after operation with emphasis on imaging and spectroscopic *operando* techniques

Required degree: MSc or equivalent in Physics, Chemistry, Nanotechnology, Chemical engineering or Materials Science.
Valuable experience: electrochemical energy storage, interfacial electrochemistry, electron microscopy,X-ray absorption.

GROUP LEADER:

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