

SEMINAR: High entropy materials as air cathodes for robust zinc air batteries

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11:00 to 12:00

Mir-Puig Seminar Room (MP210)

Rechargeable zinc-air batteries represent a cutting-edge technology with promising applications ranging from large-scale stationary energy storage for renewable energy integration to powering electric vehicles and small-scale wearable devices. However, their performance is limited by the slow kinetics of oxygen redox reactions at the oxygen cathode, which significantly restricts their practical utility. To address these challenges, there is a pressing need for a new generation of oxygen redox catalysts. High entropy materials are emerging as powerful bifunctional oxygen electrocatalysts due to their quasi-continuous distribution of surface energy levels and the extensive flexibility they offer in tuning surface compositions. These properties are crucial for optimizing the adsorption energies of reactants, intermediates, and products involved in the redox processes.

Ren He (Gavin), a Ph.D. candidate at the University of Barcelona and the Catalonia Institute for Energy Research, will present research on the high entropy materials as air cathodes for robust Zinc air batteries. In his study, CrMnFeCoNi, FeCoNiMoW, and FeCoNiPdWP nanoparticles were synthesized by a solution-based synthesis route at mild temperature, showing outstanding combined performance in both oxygen reduction and evolution reactions. Additionally, these high entropy materials nanoparticles were integrated as the air cathode in rechargeable aqueous and flexible zinc-air batteries, exhibited superior performance and stability. High entropy properties, subtle lattice distortions, and modulated electronic structure in these high entropy materials were explored and identified. A thorough investigation into the reconstruction behavior and specific roles that each metal element plays in the redox process was distinguished and clarified.

Hosted by: Prof. Dr. F. Pelayo Garcia de Arquer