PHD THESIS POSITION: NEW ORGANIC REDOX ACTIVE MATERIALS FOR NEXT GENERATION REDOX

Company Description

CIC energiGUNE is the research center for electrochemical and thermal energy storage, a member of the Basque Research and Technology Alliance- BRTA, and, a strategic initiative of the Basque Government. CIC energiGUNE was created in 2011 to generate excellent research in materials and systems for energy storage, maximizing the impact on results to the Basque Business Network, through collaboration with universities, research centers, and companies. CIC energiGUNE has a dynamic research team of more than 100 researchers and is extremely well equipped with a wide range of up-to-date facilities that are fully available for all its researchers. Also, the European Commission has recently awarded CIC energiGUNE with the ´HR Excellence in Research´ which reflects its commitment to achieving fair and transparent recruitment and appraisal procedures and certifies the existence of a stimulating and favorable work environment for researchers in the institution. For more details on CIC energiGUNE's research activities please visit our website at http://www.cicenergigune.com

Information

Deadline: 2021-01-31
Category: Business
Province: Araba / Álava
Country: Spain
City: VITORIA-GASTEIZ

Company

CIC energiGUNE

Main functions, requisites & benefits

Main functions

This PhD Project aims to develop new a generation of redox flow batteries based on the development of new organic redox active materials. Redox-Flow Batteries (RFBs) have emerged as relevant candidates to address sustainable energy generation. Their unique capability to decouple power and energy has driven the attention of companies and the scientific community based on modular design and operation, excellent scalability, moderate maintenance costs and long-life cycling. However, the scarcity of both lithium and vanadium has promoted the search for alternative chemistries. Aqueous organic redox-flow batteries (AORFBs) stand as the most promising solution to meet global energy demand based on the use of earth-abundant elements as C, H, N and O. Besides, organic molecules, based on their high tunability, could overcome technical hurdles of the state-of-the-art (VRFBs). Thus, molecular engineering will allow defining both physico-chemical and electrochemical properties of electrolytes to enable robust, long-life cycling, cost efficient and sustainable batteries. This Multidisciplinary Project, involving experimental physical chemistry and organic synthetic chemistry, aims at broadening the scope of suitable organic compounds to overcome limitations of AORFBs. Thus, an approach based on bioinspired materials aiming at non-toxic, environmentally friendly electrolytes is proposed. First, suitable chemistries will be identified based on redox-processes occurring in nature, i.e. coenzymes, vitamins, etc. Then, design and synthesis of new active materials will be carried out based on identified core structures to achieve solubility and stability whilst selectively defining the redox potential. Finally, physico-chemical and electrochemical evaluation of developed materials will be performed prior to implementation of the materials in a redox flow battery as electrolyte. Operando spectroscopic techniques and computational studies will be considered to support the study of degradation mechanisms and structure modifications. TECHNIQUES TO BE USED: Standard operating procedures for organic synthesis. Structural and physico-chemical characterization: NMR, FTIR-Raman, UV-Vis, Mass-spectroscopy, chromatography, ICP, X-ray diffraction, elemental analysis, thermogravimetric analysis, scanning electron microscopy (SEM). Electrochemical characterization: diffusion and kinetics evaluation (CV, RDE), electrochemical impedance spectroscopy (EIS).

Requisites

Holding a Master's Degree with academic background in synthetic chemistry, electrochemistry or materials science. A good team player who can collaborate with other scientists. Highly motivated person and interested in research. Excellent verbal and written communication skills in English.

Benefits

A predoctoral employment contract that covers the whole period of the thesis elaboration with a competitive salary within the category. The selected candidate will be part of a team of researchers in close collaboration with other institutions and secondment of 3 months in another institution is foreseen. Integration in an enthusiastic and multidisciplinary young group with great projection and