

## 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 (technicians, PhD, post-doc and associate 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: 2021-05-31    
  Country: Basque Country  
 Category: Business    
  City: Vitoria-Gasteiz  
 Province: Araba / Alava

## Company

CIC energiGUNE



## Main functions, requisites & benefits

### Main functions

The present PhD project is focused on the development of new electrode materials for next generation rechargeable batteries. The most advanced solid state NMR techniques available to date, will be implemented in order to guide the rational design of new materials. The resulting materials are expected to have a break through impact in the development of new rechargeable batteries for automotive and stationary applications. While long-range structural information is normally accessible from diffraction methods, solid-state NMR is an exceptionally useful tool for characterizing the local structure in electrode materials. Furthermore, since NMR spectra do not require ordered structures, it is a very suitable technique to detect and analyze disordered materials and byproducts. These components are crucial for the correct understanding of the failure mechanisms in electrode materials and they are not easily accessible by other diffraction techniques. The quantitative nature of solid-state NMR can be used to describe the ion populations that are removed on charging the battery, their pathways in the structure, the phase transitions involved in the electrodes and how the local structures are modified after extended cycling. NMR is also sensitive to molecular and ion dynamics at a large window of kinetic rates. Since the battery function is related to dynamics and rearrangement of charge carriers, ion dynamics are also important factors required for the correct understanding of the electrode performance. NMR experiments can be implemented to obtain information of the structure of the materials, the oxidation states of the elements involved in the electrochemistry, the effect of ion dynamics, cathode decomposition, the phase transitions present in the electrodes upon battery cycling, the presence of irreversible phases, the effects of dopants in the structures and their influence in the ion mobility and the material stability. The implementation of such experiments in our recently acquired insitu NMR system will further situate our center as leaders in this field. **TECHNIQUES TO BE USED:** Structural, microstructural and physic-chemical characterizations: Solid-state NMR, X-ray diffraction, electron microscopy, chemical analysis. In-situ or operando techniques (solid-state NMR, conventional and synchrotron X-ray diffraction, magnetic measurements). Electrode preparation according to industrial standards, electrochemical performance tests. Advanced electrochemical characterizations of the charge-discharge kinetics (PITT, GITT, impedance spectroscopy).

### Requisites

Holding a Master's Degree with academic background in solid state physics, solid state chemistry or materials science. Excellent speaking and writing skills in English. A good team player who can collaborate with other scientists. Highly motivated person and interested in research.

### Benefits

A Predoctoral employment contract that covers the whole period of the thesis elaboration with a competitive salary within the category. Integration in an enthusiastic and multidisciplinary young group with great projection and commitments with sustainability and research quality.