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| Call reference number | (2023-06) |
| Call name | Post-doctoral position: A coordination Chemistry Approach for Quantum Computers |
| Application Deadline | 2023/02/05 |

Introduction and main description

BCMaterials, Basque Center for Materials, Applications and Nanostructures, is an autonomous research center launched in June 2012 by Ikerbasque, the Basque Foundation for Science and the University of the Basque Country (UPV/EHU) as a research center for Materials, Applications and Nanostructures. The center is included in the BERC's (Basque Excellence Research Centers) network and its mission is to generate knowledge on the generation of new materials, turning this knowledge into (multi)functional solutions and devices for the benefit of society.

Digital technology has intimately invaded our modern life for the last three decades. The recent development of nomadic electronics is pushing the industry to create improved and smaller devices, which could store and manipulate the enormous quantity of data we are producing. But there is one technological limitation dictated by the Moore's Law: computers tend to double in speed and/or halve in size every two years to meet market demand. With the current available technology, computer manufacturers will soon be reaching the physical limits for which the inorganic magnetic materials can be used.

A potential solution to this large problem can be driven by coordination chemistry, a scientific domain that studies hybrid organic-inorganic materials that range from discrete molecules (i.e., Single-Molecule Magnets (SMMs) to 1D (i.e., Single-Chain Magnets (SCMs)) and 2D and 3D networks (i.e., Coordination polymers or Metal-Organic Frameworks (MOFs)). In particular, SMMs display useful properties at the molecular level. Their ability to store information at a nanometric scale makes them ideal candidates for future information storage devices, as they offer an ultra-high information storage density and due to their intricate quantum properties, they can also be used as qubits for future quantum computers.

While both fields have conquered remarkable landmarks in the past years, longer blocking temperatures (the current record values are close to the boiling point of nitrogen) and quantum coherence times are still required, as well as methodologies to scale-them up and implement them in devices. In this project, we will focus on the second type of systems and we will synthesize improved qubits and deposit them in targeted surfaces to create prototypes for Quantum Computing, which is mandatory to eventually cross the bridge between fundamental science and technological applications.

Skills and Requirements

The candidate must have a PhD degree in Materials Science, Chemistry, Physics or related areas before July.

Experience in the fields of coordination and polyoxometalate chemistry is required.

Knowledge about molecular magnetism, and advanced characterization techniques for qubits (e.g. pulsed EPR spectroscopy, determination of quantum coherence...) are highly welcome.

Proficiency in speaking and writing in English.

Capacity for teamwork in an interdisciplinary and international environment.

Skills and Requirements

Self-motivation and willingness to perform excellence research.
Creativity in problem solving. Ability and eagerness to learn new skills outside own discipline.
Presentation skills and ability to meet the deadline are also required.

Work Program / Duties / Responsibilities

The post-doctoral researcher will design and synthesise novel Metal-Organic Frameworks based on lanthanides and polyoxometalates. Apart from regular structural characterizations (X-ray crystallography, Infrared spectroscopy, elemental analysis, etc.) the spin coherence times and therefore, the performance of MOFs as qubits, will be determined by pulsed EPR. The most interesting MOFs will be exfoliated into thin films and deposited in surfaces.

Application Procedure

Apply by submitting a motivation letter and a CV (in English) using the "Contact" button at the corresponding offer, at the "Join Us" area on BCMaterials' portal (<https://www.bcmaterials.net/join-us>).
Your name and email address will be required for further contact too.

Other Relevant Information

Interview will be conducted soon after the deadline. The starting date to join is before 1st of July.