QUSTEC doctoral programme. Scanning probe microscopy of atomic structures and molecular assemblies on superconductive materials / MSCA

Réf ABG-86763 Sujet de Thèse
18/07/2019 > 45 et < 55 K€ brut annuel

University of Basel

Lieu de travail Basel - Suisse

Intitulé du sujet

QUSTEC doctoral programme. Scanning probe microscopy of atomic structures and molecular assemblies on superconductive materials / MSCA

Champs scientifiques • Physique

Mots clés QUSTEC, quantum electronics, scanning tunneling microscopy, atomic force microscopy

Description du sujet

Context. The advent of high-resolution imaging and manipulation using scanning probe techniques at low temperature has permitted the built-up of atomically-precise structures and opened new horizons to access exotic quantum states in matter. This aim, not only requires an experimental control of these structures at the atomic level, but also an in-depth understanding of the interactions between spins and electrons arising in these strongly correlated systems.

During this PhD, high-resolution scanning tunneling microscopy (STM) and atomic force microscopy (AFM) at low temperature will be employed to characterize at the atomic level atomic structures and molecular assemblies grown on superconductive materials. The superconductor substrates (Pb(100) or Nb(100)) will be prepared under ultrahigh vacuum conditions. Magnetic atoms or molecules with magnetic cores will be deposited by thermal evaporation or electro-spray deposition. We will also study 2D-materials, such as porous graphene, where we expect to observe uncompensated spins due to charge transfer or doping.

The central task of the project consists in the detailed analysis using STM/AFM of the structures, electronic states and spins in these magnetic structures on superconductors. The structural information will be gathered using AFM measurements while Yu-Shiba-Rusinov (YSR) states appearing in these systems will be explored using tunneling spectroscopy at very low temperature (1K and 25mK) through joint works at the KIT and Uni Basel. An important aim will also be the development of manipulation techniques with the probing tip to tune the exchange coupling of molecular magnets or construct atom-by-atom networks. The influence of neighboring magnetic atoms will be investigated by spin-sensitive measurements in the atomic wires and molecular aggregates to discover potential Majorana bound states at their edges.

PhD supervisor:

Prof. Dr. Ernst Meyer https://nanolino.unibas.ch/

Prise de fonction :

01/11/2019

Nature du financement

Financement de l'Union européenne

Précisions sur le financement

MSCA-COFUND

Présentation établissement et labo d'accueil

University of Basel

The Departement of Physics of the University of Basel is a center for international top-level research in the fields of nano and quantum physics, and cosmology and particle physics. Our students benefit from the excellence in research that offers them an outstanding range of courses supervised by highly talented assistants and renowned professors.

Two modern fields of physics make up the focal areas of our department: nano and quantum physics, and cosmology and particle physics. Nano and quantum physics are concerned with the research of structures at the nanometerscale as well as with understanding and controlling the quantum

phenomena that occur in the process. Cosmology and particle physics examine the fundamental elementary particles of matter and develop the physical theory of the evolution of the universe. Both fields are connected through quantum physics serving as their underlying basic theory. Driven by new experimental possibilities and theoretical insights, the two fields are currently seeing a rapid development to which we are actively contributing. The research results gained along the way will shape both the scientific world view and the technologies of the future.

Site web :

https://www.physik.unibas.ch/department/about-us.html

Intitulé du doctorat

Doctorat de Physique

Pays d'obtention du doctorat

Suisse

Etablissement délivrant le doctorat

University of Basel

Ecole doctorale

Profil du candidat

Eligibility criteria and requirements

Physics student with some experience in ultrahigh vacuum probe microscopy are most welcome.

QUSTEC programme follows MSCA eligibility criteria:

Required level of experience is 'Early Stage Researcher' according to the definition in the work programme of the 2018-2020 Marie Skłodowska-Curie actions: Applicants must be, at the date of the respective call deadline of QUSTEC, in the first four years (full-time equivalent research experience) of their research careers and not yet have been awarded a doctoral degree.

Mobility criterion: The applicants must not have resided or carried out their main activity (work, studies, etc.) in the country of the future host organisation for more than 12 months in the 3 years immediately before the call deadline of QUSTEC. Short stays such as holidays are not taken into account. For refugees under the Geneva Convention, the refugee procedure (i.e. before refugee status is conferred) will not be counted as period of residence/activity in the country of the host organisation.

Date limite de candidature

19/08/2019
Partager via