Post-doctoral positions in 2D Spintronics

Post-doctoral positions are available in Prof. Barbaros Özyilmaz's group at the National University of Singapore (NUS) in the field of 2D spintronics by our group.

Since the first demonstration of the electric field effect in ultrathin black phosphorus (BP) by our group, we have expanded our study of 2D spintronics to semiconductors (e.g. BN) and superconductors (e.g. NbSe2).

On the one side, we have obtained strong evidence of ferromagnetism in Co-doped BP. Large tunnel magnetoresistance (TMR) with strong gate tunability has been demonstrated in a vertical tunnel device composed of ferromagnetic BP. Therefore, the two key ingredients for creating Majorana Bound States (MBSs) have been realized, namely, strong spin-orbit coupling and tuneable chemical potential. Introducing superconductivity into the ferromagnetic BP via proximity effect would be the focus of the next stage research, by which we aim to create the full recipe for realizing MBSs in the 2D semiconductor/superconductor heterostructure for the first time. We believe our work will pave the way to the experimental implementation of topological quantum computation.

On the other side, we have developed a unique technology to introduce ferromagnetism into the superconducting few-layer $NbSe_2$ and observed a reproducible signature of the co-existing of long-ranged spin and superconductivity. The nature of type-II superconductivity and Ising spin-orbit coupling in few-layer $NbSe_2$ opens a new pathway towards robust topological superconductivity, which is also highly relevant to the realization of MBSs. Our discovery implies the possibility of creating enhanced fluxions pinned by magnetic doping in 2D superconductors, which leads to the feasibility of realizing spin-triplet superconductivity for topological quantum memory.

In order to further advance the field of 2D spintronics in regard of topological quantum computation, we need to hire more people to: 1) Study spin behaviour in various 2D semiconductors and superconductors; 2) Design smart device architectures to realize MBSs based on 2D heterostructures.

We invite suitable post-doctoral candidates who are passionate to develop this exciting research field to apply.

ELIGIBILITY:

Candidates should hold a PhD in Physics, Material Science, Nanoscience and Nanotechnology, Electronic or Chemical Engineering, or related disciplines.

The ideal candidate will possess the following:

1. Proven track record of excellence in experimental research with 2D materials.
2. Strong command of English language.
3. Excellent communication and collaboration skills.
4. Demonstrate team leadership and project planning.