

Development of a spin transistor

Alongside with the Departmental research theme, "Advanced Computational Technologies," we seek a PhD student who is interested in developing a next-generation transistor using not electron charges but electron spins. Such a transistor can reduce electrical power consumption by >40% and can operate at >50% faster speed as compared with the current Si-based CMOS technology. To date, the group has developed a growth method to form an abrupt metal/semiconductor interface for the first time [1] and has also demonstrated a way to amplify an electron-spin flow in such a device [2]. A successful PhD candidate will utilise these techniques and will focus on developing a spin-based transistor concept. It is preferable that the candidate has some hands-on experience on thin film growth in an ultrahigh vacuum and/or nanometric scale device fabrication.

The devices will be grown using our ultrahigh vacuum molecular beam epitaxy (UHV-MBE) system in the Department, which can maintain a vacuum as low as 1.2×10^{-8} Pa. The devices will then be patterned in the state-of-the-art electron beam lithography system in Leeds, where we have a 25% share. This system can pattern 7 nm feature with stitching and overlay accuracy of <1 and <7 nm, respectively. The successful devices will be measure by our transport measurement setup, which can handle signals up to GHz frequency and temperature down to 350 mK.

The research team currently has 9 PhD students and 1 Experimental Officer. An enthusiastic PhD candidate will fit perfectly to our team. We have been active in the field of spintronics with many collaborators within the UK, EU and worldwide. We also work closely with the Department of Physics. The PhD students are normally given an opportunity to present their works at annual domestic Magnetism conference and at least once in an international conference, such as International Conference on Magnetism or Magnetism and Magnetic Materials.

[1] L. R. Fleet *et al.*, *Physical Review B* **87**, 024401 (2013).

[2] R. M. Abdullah *et al.*, *Journal of Physics D: Applied Physics* **47**, 482001(FTC) (2014).

If you are interested in applying for this studentship and would like to know more about the project, please contact Prof Atsufumi Hirohata (atsufumi.hirohata@york.ac.uk).

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