About the Quantimony Project

An H2020 Marie Sklodowska-Curie Actions funded PhD studentship position in Quantum Semiconductor Technologies exploiting Antimony is available in the Department of Physics at The University of Warwick.

You will join the group of Prof. Richard Beanland (https://warwick.ac.uk/go/microscopy/research/staff/rb/) in the Department of Physics. You will be part of a cohort of international early stage researchers working as part of the QUANTIMONY Innovative Training Network (ITN). This ITN combines a group of world-leading laboratories and organisations, where early stage researchers benefit from academic and industrial collaboration and research skill training.

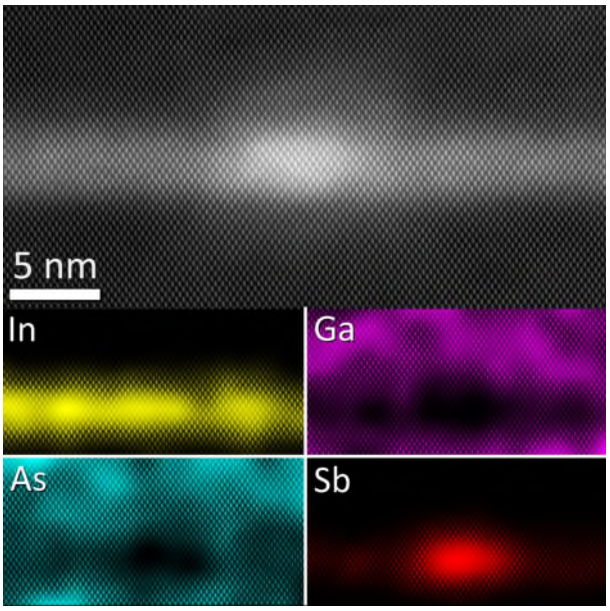

Fig. 1. Top: Aberration-corrected annular dark field scanning transmission electron microscope image of an InSb quantum dot in a GaAs matrix. Bottom: Composition maps produced by X-ray spectroscopy.

For more details on the ITN see: https://cordis.europa.eu/project/id/956548

You will become an expert in electron microscopy and analysis performed at the highest resolution, imaging individual atom columns and measuring their composition. Many antimonide devices rely on control of structures that are only a few atoms in size, such as the quantum dot shown in Fig. 1. You will develop methods to extract useful measurements from these data and work with other ITN partners with expertise in crystal growth, device design and manufacture to understand and control these materials and develop new applications.

One of the particular challenges of antimonide devices is the rapid diffusion of Sb and the difficulty of incorporating a Sb atom into a growing crystal. This tends to produce a segregated layer at the growth surface, which is only slowly incorporated into the material, making the production of atomically-sharp interfaces difficult. In addition, the large mismatch in lattice parameter between antimonide compounds and widely available substrates (e.g. silicon) leads to the generation of defects that degrade device properties. We cannot control these issues without being able to measure them, and your work will bridge between the ideal structures as they have been designed and the actual materials produced in reality. You will also make measurements of functional parameters such as carrier mobilities, recombination rates and radiation emission that can be linked to the structures you observe.

Duties and Responsibilities

- You will be undertaking a PhD studentship as part of this role
- You will undertake innovative research in the characterisation of semiconductor devices

containing antimony
• You will conduct conventional and aberration-corrected atomic resolution transmission electron microscopy as well as electronic device characterisation to help optimise the device performance; and inspire improved design of these materials
• You will integrate closely with other members of the ITN to share results and learn from what other researchers are performing
• You will attend training courses and workshops required as part of the ITN
• You will publish your work in academic journals and attend conferences to present your work, both in the UK and abroad

Essential Requirements

It is important that you check your eligibility for this ITN award before applying. Full eligibility criteria can be found in the Job Description.

In order to be considered for this position, you must:

• Have obtained, or be close to completing, a first-class (or equivalent) first degree or a master's degree in a relevant subject (e.g. Physics, Materials Science, or Chemistry)
• Demonstrate knowledge of the basic crystallography and electronic properties of III-V materials in general and antimonides in particular
Depending on the applicant's previous subject training and research project(s), knowledge or experience of one or more of the following aspects would be an advantage:
• Experience or knowledge of semiconductor growth, e.g. by molecular beam epitaxy
• Experience or knowledge of spectroscopies commonly used on electron microscopes, e.g. X-ray, cathodoluminescence or energy loss spectroscopy
• Experience or knowledge of diffraction techniques using X-rays, electrons or neutrons
• Experience or knowledge of defects such as dislocations.

Funding Notes

Salary – with family: £38,659.32 per annum / without family: £35,326.91 per annum