



Further Particulars:

**Research Associate in the Fabrication of III-V
Nanowire Quantum-Dot Materials and Devices –
Molecular Beam Epitaxy Growth**

- Job Title:** Research Associate – MBE Growth
- Department:** Electronic and Electrical Engineering
- Reports to** Principal Investigator of UCL EPSRC project: **“GaAsP-GaAs nanowire quantum dots for novel quantum emitters”**
- Grade:** Research Assistant Grade 6, salary range between £29,485 and £31,091pa (inc. London Allowance of £2948, pa) depending on the experience
- Research Associate Grade 7, salary range from £33,686 to £40,716 (inc. London Allowance of £2,948 pa) depending on the experience.
- Start Date:** The position is available from 1st October 2016 or as soon as possible thereafter for a period of 36 months. Further funding to support the post may be available.

A PhD degree (or about to submit) in a relevant subject is required. If the successful candidate has not completed their PhD yet, appointment will be made at Research Assistant level at grade 6 point 24-26, on the UCL salary scale (£29,485 and £31,091 per annum) with payment at Grade 7, point 29 being backdated to the date of final submission of the PhD thesis (including corrections).

Project Outline

The fully quantised electronic states of zero-dimensional quantum dots (QDs) permit the fabrication of both classical and non-classical highly efficient photon emitters, with significant advances for lasers and single photon sources. To date, virtually all QD physics and device studies have utilised self-assembled QDs, whose formation is strain driven. These QDs exhibit high optical efficiency and large areal density but have significant disadvantages, including formation at random positions, large inhomogeneous size distributions, limited shape and size control, difficulty in forming stacks of identical QDs, and restrictions on the semiconductor combinations within a single structure. Formation at pre-determined positions is a particular requirement for many applications requiring single QDs.

III-V nanowire (NW) growth has been achieved via the vapour-liquid-solid (VLS) mode initiated by Au droplets. However, these introduce external contaminants which seriously degrade the electrical and optical properties of the NWs. More recently, self-catalysed (SC) III-V NWs have been intensively developed with growth initiated via the group-III element or in pre-defined holes in a surface mask; both approaches avoid contamination by external metals. By changing the composition during the nanowire growth it is possible to introduce one or QDs within a nanowire, leading to the formation of nanowire quantum dots (NWQDs). Compared with self-assembled QDs, III-V NWQDs offer advantages which include precise control of position and size, the lack of a wetting layer, and direct integration with the silicon platform. Because of their significant potential, there has been recent effort made to fabricate SC III-V NWQDs. In the last couple of years, we have developed III-V nanowires and NWQDs by exploiting different material systems. Very recently, we have demonstrated the first defect-free SC III-V NWQDs on Si substrates at UCL, based on GaAs QDs within GaAsP nanowires. Our initial work has demonstrated significant advantages of GaAsP/GaAs NWQDs over other NWQD systems, including defect free, fully zinc blende structures and reduced surface states due to the P containing nanowire material. Building on these very promising initial studies, we will work on a comprehensive programme of growth development, structural and optical characterisation and device development of silicon-based QD emitters based on GaAsP/GaAs NWQDs for silicon photonics in this project.

This project is funded by EPSRC and collaborated with University of Sheffield and University of Warwick. One of the tasks of University College London is to carry out the epitaxial material growth of III-V nanowires and nanowire quantum dot structures grown on silicon substrates. This Research Associate post will be part of Photonics Group, and work under Professor Huiyun Liu and Dr Jiang Wu with state-of-the-art Molecular Beam Epitaxy (MBE) facility at the department of Electronic and Electrical Engineering, and advanced device-processing facility in London Centre for Nanotechnology.

Research Associate in MBE growth

Duties and Responsibilities

The Research Associate in MBE growth will be responsible for carrying out the MBE growth of III-V nanowires and nanowire quantum dots at the Department of Electronic and Electrical Engineering with assistance from members of UCL academic staff, other undergraduate and postgraduate student support, and technical staff. The following is indicative of the duties and responsibilities associated with this post:

- Lead on the development of the high-quality III-V nanowire and nanowire quantum dot materials on silicon substrate by the use of MBE reactor.
- Develop new nanowire and nanowire quantum dot epitaxial structures and carrying out independent research in related field.
- Routinely operate UCL MBE facility.
- Regularly communicate and work in close collaboration with the Research Associate working on device fabrication at UCL and the other consortium members at University of Sheffield and University of Warwick.
- Provide supervision, advice and guidance to undergraduate project and PhD students.
- Travel to consortium partner institutions to perform joint experiments and assist any visiting researchers from partner institutions.
- Contribute to the preparation of reports and the presentation of results at progress meetings.
- Publish research in leading journals and present it at national and international conferences.
- Contribute to the overall activities of the research team and department as required.
- Ensure that equipment is safe and maintained in working order and to maintain an awareness of UCL Fire and Health and Safety regulations.
- Actively follow UCL policies including Equal Opportunities policies

As duties and responsibilities change, the job description will be reviewed and amended in consultation with the postholder, and will carry out any other duties as are within the scope, spirit and purpose of the job as requested by the line manager or Head of Department/Division.

The post is to be held in the UCL Department of Electronic and Electrical Engineering working in close collaboration with LCN. The commercial aspects of the project will be carried out in collaboration with UCL Business (UCLB) and potential Industrial partners.

Qualification/Skills Required

- A first degree in an engineering or physical sciences subject (essential)
- PhD in relevant area of semiconductor technology (or about to submit) (essential).
- Proven capability in epitaxial growth by MBE (essential).
- Track record in MBE research (essential).
- Ability to analyse and write up data in the form of journal papers and reports (essential).
- Ability to organise and plan work effectively to meet deadlines (essential).
- Capability to develop an independent research profile within the period of the grant (desirable).

Personal

- Excellent interpersonal and communication skills (essential).
- Ability to present technical information effectively to a range of audiences (essential).
- Commitment to high quality research (essential).
- Ability to work collaboratively and as part of a team (essential).
- Commitment to UCL's policies, e.g. equal opportunity, health and safety (essential).

About UCL and the Departments of Electronic and Electrical Engineering

University College London (UCL) was founded in 1826 as the third university in England, after Oxford and Cambridge. UCL is however the first university in England to admit students of any race, class or religion, and the first to welcome women on equal terms with men. UCL is now the largest comprehensive university in London with more than 4,000 academic and research staff in 72 departments. The main campus of UCL is located in central London, just a few minutes walking distance from British Museum, West-End and Thames River.

The Department of Electronic and Electrical Engineering at UCL was established by Professor Sir Ambrose Fleming in 1885 and has a very strong research culture, state-of-the-art research equipments and facilities, and a very rich history of many fundamental research achievements in electronic and electrical engineering. The Department currently hosts international renowned research groups in Communications and Information Systems; Photonics; Optical Networks; Microwaves, Radar and Optics; Electronic Materials, Devices and Nanotechnology. For more information about the department and our research achievements, please visit the website <http://www.ee.ucl.ac.uk>

Further information regarding UCL may be found at:
www.ucl.ac.uk/

Information about the departments may be found at:
www.ee.ucl.ac.uk

HOW TO APPLY

Please apply online via the following link:

www.ucl.ac.uk/hr/jobs and search for reference **1570109**

You will need to upload the following documents with your application:

- CV (including the names and contact details of at least two referees who may be contacted prior to interview.)
- An up to date list of publications.

Interested applicants are encouraged to make informal enquiries to Professor Huiyun Liu, huiyun.liu@ucl.ac.uk, 020 7679 3983, or Dr. Jiang Wu, jiang.wu@ucl.ac.uk, 020 7679 4466

If you experience any problem please contact Vicky Coombes at v.coombes@ucl.ac.uk quoting Job reference 1570109

Please note that there is another Research Associate post being advertised under the same project, in the area of Device Fabrication. Further details of this post can be found at the following link

<http://www.ucl.ac.uk/hr/jobs> and search for reference **1570116**

Thank you for your interest in this position.

UCL Taking Action for Equality