

Job Description

Job title	Research Fellow
Department	Physics
Grade	6

Job purpose (a brief summary of the role)	Undertake high-quality experimental research on Si/SiGe epitaxial materials and semiconductor heterojunctions. Lead hands-on I–V, C–V and G–V electrical characterisation from room temperature down to approximately 2 K and correlate the results with XTEM, HR-XRD and other structural or compositional data. Investigate links between doping, defects, interfaces and low-temperature charge transport. HBT fabrication is undertaken by collaborating institutions, not Warwick.
Duties and responsibilities	1. Design, plan and conduct experimental research on Si/SiGe epitaxial heterostructures and semiconductor test structures, delivering agreed project milestones. 2. Independently perform I–V, C–V and G–V measurements from room temperature down to approximately 2 K, including cryogenic setups, instrument configuration, calibrations, electrical contacts and appropriate controls. 3. Systematically analyse bias-, temperature- and frequency-dependent electrical characteristics, including transport, carrier freeze-out, leakage, interface states, parasitic effects and measurement uncertainties. 4. Perform and/or coordinate advanced structural and morphological characterisation, including XTEM, HR-XRD and supporting chemical or compositional techniques. 5. Quantitatively correlate electrical and structural datasets to establish the influence of alloy composition, strain, dopant profiles, interfaces, defects and epitaxial process conditions on material and junction properties. 6. Work with RP-CVD epitaxy team to refine growth conditions and heterostructure design in response to characterisation results. 7. Where appropriate, undertake or support FIB sample preparation and SEM/XTEM studies of HBT devices fabricated by project partners. HBT fabrication itself is not a responsibility of this role. 8. Establish robust measurement, calibration, analysis and data management practices, maintaining complete and reproducible experimental records. 9. Collaborate closely with Caltech and other project partners, contributing to joint technical discussions, reports and project milestone reviews. 10. Publish research findings in peer-reviewed journals, present at relevant meetings and conferences, and contribute where appropriate to future funding proposals. 11. Comply with laboratory health and safety, research integrity and relevant University procedures, and collaborate effectively with research and technical colleagues. The specific balance of activities may develop as the project progresses within the scope of the appointment.

Person Specification

The Person Specification focuses on the essential and desirable knowledge, skills, experience and qualifications required to undertake the role effectively. This is measured by (a) Application Form, (b) Test/Exercise, (c) Interview, (d) Presentation.

Essential Criterion No.	Essential Criterion Description	Measured by
E1	Hold, or be close to completing, a PhD or equivalent qualification in semiconductor physics, materials science, materials engineering or a closely related discipline.	A
E2	Evidence of high-quality original experimental research in semiconductor materials or devices, including clear individual contributions and relevant research outputs.	A
E3	A developing research profile and demonstrated ability to interpret results critically and produce publishable scientific reports or papers.	A
E4	Strong specialist knowledge of semiconductor epitaxial materials, heterointerfaces, doping, strain, crystal defects and their relationship to semiconductor electrical properties.	A,C & D
E5	Ability or potential to contribute to the preparation of proposals for external research funding.	A & C
E6	Ability to design, organise, troubleshoot and deliver rigorous experimental research to agreed milestones and deadlines.	A & C
E7	Ability to work independently and collaboratively within multidisciplinary and international research teams.	A & C
E8	Clear written and oral scientific communication, including the ability to defend experimental methods, analysis, uncertainty and conclusions.	A,C & D
E9	Commitment to uphold the provisions of the Equality Act 2010, professional conduct and respectful research practice.	A,C & D
E10	Substantial personal hands-on experience of all three semiconductor electrical characterisation techniques: current–voltage (I–V), capacitance–voltage (C–V) and conductance–voltage (G–V), including setting up or operating measurements and analysing experimental data.	A,C & D
E11	Demonstrable hands-on semiconductor electrical characterisation experience over temperatures extending from room temperature down to approximately 2 K, including the practical operation of low-temperature measurement instruments.	A,C & D
E12	Ability to interpret voltage-, frequency- and temperature-dependent I–V, C–V and G–V data quantitatively, identifying physical transport and junction effects, leakage, interface/defect response and measurement artefacts.	A,C & D
E13	Substantial practical semiconductor materials characterisation skills, including hands-on experience in at least two of XTEM, HR-XRD and AFM, and the ability to evaluate and correlate complementary structural and electrical data.	A,C & D
E14	Ability to maintain robust data and laboratory records, ensure reproducibility, and follow specialist laboratory health-and-safety procedures.	A,C & D

Desirable Criterion No.	Desirable Criterion Description	Measured by
D1	Detailed experience with Si, Ge or SiGe epitaxial heterostructures, including doping, alloy composition, strain, crystal defects and interface quality.	A,C & D
D2	Practical FIB, SEM, cross-sectional TEM specimen preparation, STEM/EDX, XRR, SIMS, FTIR or spectroscopic ellipsometry experience.	A,C & D
D3	Experience with cryogenic probe stations, dilution or helium cryostats, precision source-measure instruments, LCR/impedance analysers, lock-in techniques, equivalent-circuit or conductance-method analysis, and automated low-noise measurement.	A,C & D

D4	Understanding of SiGe heterojunction bipolar transistors, cryogenic semiconductor devices, junction non-idealities, and the relationship between epitaxial materials and transistor characteristics.	A,C & D
D5	Experience with RP-CVD or related semiconductor epitaxial growth, quantitative correlation of microscopy/diffraction and electrical measurements, or collaboration with shared specialist facilities.	A,C & D