IHP GmbH - Leibniz-Institut für innovative Mikroelektronik

Das IHP ist ein Institut der Leibniz-Gemeinschaft und betreibt Forschung und Entwicklung zu siliziumbasierten Systemen, Höchstfrequenz-Schaltungen und -Technologien einschließlich neuer Materialien. Es erarbeitet innovative Lösungen für Anwendungsbereiche wie die drahtlose und Breitbandkommunikation, Sicherheit, Medizintechnik, Industrie 4.0, Mobilität und Raumfahrt. Das IHP beschäftigt ca. 330 Mitarbeiterinnen und Mitarbeiter. Es verfügt über eine Pilotlinie für technologische Entwicklungen und die Präparation von Hochgeschwindigkeits-Schaltkreisen mit 0,13/0,25 µm-BiCMOS-Technologien, die sich in einem 1000 m² großen Reinraum der Klasse 1 befindet.

PhD Position (m/f/d) for Fabrication of Spin-qubit-based Quantum Dot Devices

Job-ID: 7012/26 | Department: Technology | Salary: as per tariff (TV-L) | Working Time: 40h/week ((part-time work option) | Limitation: initially 2 years with option of extension | Starting Date: as soon as possible

City: Frankfurt (Oder); Starting date (earliest): At the earliest possible; Duration: 2 years; Remuneration: TV-L

Working field

The position:
IHP is advancing semiconductor-based quantum technologies using its industrial 200 mm BiCMOS pilot line and is seeking a highly motivated PhD candidate to help bridge state-of-the-art silicon microelectronics and scalable quantum devices. In this position, you will develop and optimize process flows for Hall bars and quantum dot devices in Si/SiGe and Ge/SiGe heterostructures, aiming at spin qubits and their integration with our BiCMOS technology. Your work will span device design, cleanroom fabrication and electrical characterization at room and cryogenic temperatures, including the first on-chip control and readout concepts. Close collaboration with internal and external partners in materials growth, modeling and cryogenic electronics will be an integral part of your role and of IHP’s growing activities in quantum information technologies. The module “Ion Implantation and Rapid Thermal Annealing (RTA)” provides essential process-technology knowledge that is directly applicable to the practical work described in the PhD position. Rapid thermal annealing is used to activate implanted dopants, repair lattice damage, and tailor interface and material properties.
Ion implantation is a key technique for the controlled introduction of dopants in semiconductor devices, for example in contact regions, gate structures, or isolation areas. A solid understanding of implantationinduced damage, dopant distribution, and interactions with heterostructure interfaces is particularly relevant for the fabrication of spin-qubit-based quantum dot devices, where material quality and reproducibility are crucial. Rapid thermal annealing is used to activate implanted dopants, repair lattice damage, and tailor interface and material properties. These processes are directly relevant for the integration of quantum devices into an industrial 200 mm BiCMOS pilot

line, as required in the advertised position.
These processes are directly relevant for the integration of quantum devices into an industrial 200 mm
BiCMOS pilot line, as required in the advertised position.

Your PhD Project:
Your PhD project will evolve from materials and device foundations towards functional quantum devices with on-chip support electronics. You will extend existing Si/SiGe Hall bar technology to Ge/SiGe and adapt these platforms towards quantum-dot and later spin-qubit devices, while designing quantum circuits (e.g. SETs, quantum-dot arrays, charge carrier reservoirs) including test structures for process control, largely compatible with the IHP PDK. In close collaboration with the team, you will plan, organize and process wafer lots, analyze in-line electrical characterization and prepare results for internal discussions and process optimization. Together with the semiconductor quantum materials you will participate in low-temperature quantum transport experiments, formulate and test hypotheses on how geometry, materials and process parameters affect device performance, debug process-related issues with IHP diagnostics team, and use this feedback to refine device concepts. You will disseminate your findings through publications in peerreviewed journals and presentations at international conferences and workshops.

Requirements

Your qualifications:
You hold a Master’s degree in physics, electrical engineering, semiconductor technology, or a related field.
You have a solid foundation in semiconductor technology and device physics, along with hands-on
experience in device fabrication and electrical characterization. Ideally, you have experience in working in a cleanroom. A background in semiconductor material growth and characterization is highly desirable.
Proficiency in data analysis using tools such as Python, MATLAB, or similar software is expected.
We are looking for a strong team player who can plan and carry out work independently while contributing effectively in a collaborative research environment. You will thrive in this position if you bring a combination of experimental skills, analytical thinking, and problem-solving ability. Strong communication skills, a quick grasp of new tools and technologies and, above all, an independent and curious mindset will make you an excellent fit for our team. As IHP is an international research center, fluency in English is required. German language skills are welcome; the improvement of German language skills is expected and strongly encouraged, for example through in-house language courses and intensive classes.

What we offer

Our Offer:
Conduct research in a challenging, multinational environment giving you excellent career opportunities.
You will have the chance to establish international reputation at the edge of top-notch technologies.
It is important to us to support the individual career developments (e.g. conferences, advanced trainings) as well as the personal needs of our employees by offering flexible working hours and the possibility to work off-site. The compatibility of work and family is highly valued. More information about our scientific excellence and the working environment at IHP can be found on our website.
IHP is TOTAL E-QUALITY-certified for equal opportunities for women and men at work and actively pursues the equality of all gender and all groups of people. We promote the professional development of women and strongly encourage them to apply. Disabled applicants, qualified according to the above criteria, will be given preference over other candidates with equivalent relevant qualifications.

Further advantages:
30 days holiday | special annual payment | Company pension scheme (VBL) | Flexible working hours, also part-time (no core working hours) | Possibility to work up to 40 % independent of location according to company agreement | A wide range of further training opportunities in-house or within the framework of business trips | Discounted company ticket with monthly allowance of € 15,75 for various fare zones | Structured induction and actively supported integration into the institute (welcome workshop, intercultural workshop, joint leisure activities)

Application

Contact person: Dr. Lisker

By internet: https://www.ihp-microelectronics.com/career/vacancies/online-application-form?job=7012/26#c977

More information at https://stellenticket.de/200383/TUB/
Offer visible until 04/02/26