Paul-Drude-Institut für Festkörperelektronik

Leibniz Gemeinschaft

The Paul Drude Institute for Solid State Electronics (PDI) in Berlin, Germany, is an independent research institute of the Leibniz Association with about 100 employees from over 15 nations, carrying out basic and applied research at the nexus of materials science, condensed matter physics, and device engineering. You may find more details at www.pdi-berlin.de. We seek a student (f/m/d) to work on

Master thesis: Growth & Characterization of atomically thin hexagonal-BN/graphene heterostructure

Two-dimensional (2D) van der Waals heterostructures combining materials like graphene and hexagonal boron nitride (h-BN) are very promising for the realization of atomically thin electronic devices, such as ultra-steep-slope tunneling transistors for low-power digital applications. Here, h-BN plays a central role in two ways: electronically, its large band-gap enables efficient electronic confinement as required in ultra-thin layers. On the other hand, its chemical inertness (i.e. the lack of dangling bonds) and high mechanical strength make it an ideal substrate or encapsulation layer for other 2D materials. Currently used preparation techniques such as mechanical exfoliation and stacking of 2D materials are hardly scalable and lack reproducibility. Therefore, developing large-scale synthesis of 2D heterostructures via epitaxial growth of a 2D material on top of another one (the so-called van der Waals epitaxy) is critical for future applications. Due to the intrinsically weak bonding between 2D materials, van der Waals epitaxy is quite challenging since the existence of surface defects and morphological features (e.g. wrinkles) in 2D materials disturbs the growth process, giving rise to the formation of polycrystalline materials.

This Master thesis project aims at the study of the synthesis and characterization of h-BN/graphene van der Waals heterostructures. Specifically, the Master student will utilize a radio-frequency furnace for the growth of graphene films on SiC (0001), and will assist with synthesis of atomically thin h-BN layers (on top of graphene) using molecular beam epitaxy. In addition, the student will utilize methods such as atomic force microscopy, X-ray photoelectron spectroscopy, Raman spectroscopy, to investigate the morphological, chemical, and optical properties of h-BN/graphene heterostructures grown on SiC. The main goal is to optimize the materials synthesis by controlling various aspects such as thickness, phase and orientation of h-BN on epitaxial graphene. The position is available starting from April 1st, 2023.

PDI takes an active role in building a talented, inclusive, and culturally competent workforce. We understand that our shared future is guided by basic principles of fairness and mutual respect. We aim to increase the number of female scientists at the institute; applications from women are particularly welcome. Among equally qualified applicants, preference will be given to candidates with disabilities. PDI is a member institute of the Forschungsverbund Berlin e. V. Salary and benefits are according to the Treaty for German public service (TVöD). As equal opportunity and family-friendly employer, we offer highly flexi-

ble employment conditions, such as flexible working hours, parental leave, and home office. We strive to create a family- and life-conscious work environment.

Please send scientific inquiries and applications (dedicated cover letter, CV, transcripts) to Dr. Neha Aggarwal (aggarwal@pdi-berlin.de, +49.30.20377.351) or Dr. J. Marcelo Lopes (lopes@pdi-berlin.de, +49.30.20377.327) and inquiries regarding diversity, equity and inclusion to the equal opportunity officer Katrin Morgenroth (she/her/hers) (morgenroth@pdi-berlin.de, +49 30 20377 364).