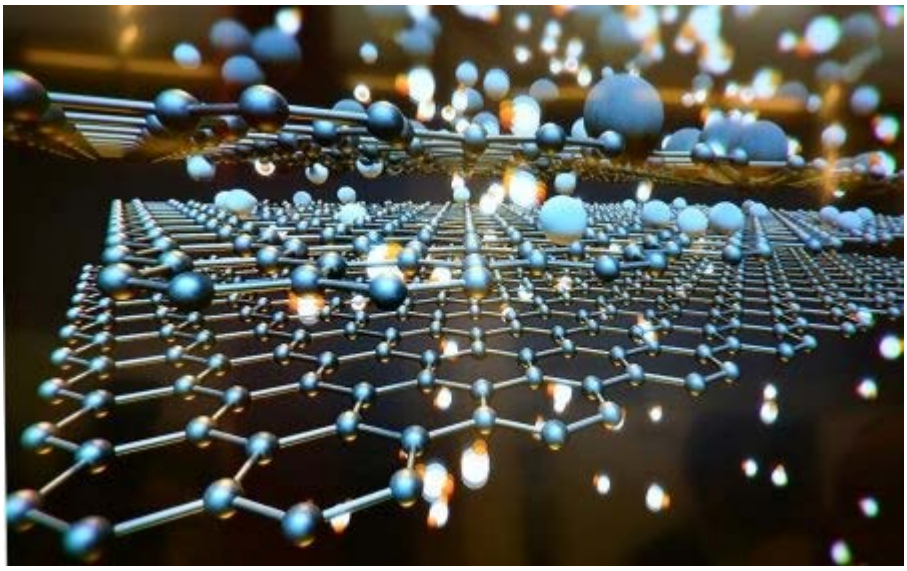
Molecules on graphene as functional nanocomposites



About the project or challenge area: Graphene, a two-dimensional monolayer of carbon atoms, has gained wide interests since its discovery. In many potential applications of graphene in bioanalytic devices and functional composites, it often comes into intimate contact with aqueous systems containing ions and bio(macro)molecules. Using X-ray reflectivity (XRR) at European Synchrotron Radiation Facility (ESRF, France), results from a Bristol MRes project has recently revealed the presence of a diffuse air-bubble layer on chemical vapor deposited (CVD) graphene when it is submerged in water. The air-bubble layer then diminished, and the graphene-water interface would become enriched with ionic species from the aqueous media. These unprecedent results have important implications to bioanalytic and nanotechnological applications of graphene in which its dynamic interfacial structure in contact with electrolyte solutions is crucial https://sciencetrends.com/vanishing-air-bubble-layer-and-ion-adsorption-on-graphene-in-aqueous-media/. This project will utilize quantitative state-of-the-art physicochemical methods, including neutron and X-ray scattering (at central facilities in the UK, France, and Germany), AFM and SEM imaging, to interrogate the interfacial structure at the graphene-water interface self-assembled from lipids and biomacromolecules.

Why choose this opportunity? Graphene is among the most exciting scientific discoveries of recent times, with immense potential for future exploitation as functional materials. The work in this area will advance our fundamental knowledge underpinning such potential. You will develop knowledge in fundamentals of graphene, lipids, biopolymers, nanocomposites, colloid and interface science. You will also develop expertise in quantitative physicochemical techniques, including synchrotron X-ray scattering. Our group is highly international and dynamic, with extensive industrial and academic links in the UK and worldwide. You will have the opportunity to interact and collaborate with the members across the group, developing transferrable skills. Specifically, we will have the opportunity to collaborate with a UK-based graphene manufacturer to implement your knowledge in real applications. Your professional and personal development, as well as enriching cultural experience, is central to the training programme. You will be supported throughout the project through individual and group meetings, graduate courses, and technical training, tailored to your specific needs. You are encouraged and supported to present your work at international conferences publish your work at international journals.

About you: Skills and knowledge in physics, materials, chemistry, analytical methods, and colloid science is desirable but not essential. Training will be provided.

Bench fees: A bench fee of £4000 is required. A small number of School of Chemistry Bench fee bursaries are available to part-cover bench fees

How to apply: Applications are accepted throughout the year and you should complete the online application form for Chemistry (MSc by Research).

Supervisor: Dr Wuge Briscoe, Reader in Physical Chemistry in the School of Chemistry. You can contact him at +44 (0) 117 3318256 or email wuge.briscoe@bristol.ac.uk

Find out more about your prospective research program: "2010 Nobel Physics Laureates" (PDF). nobelprize.org; *Graphene surface structure in aqueous media: Evidence for an air-bubble layer and ion adsorption* https://doi.org/10.1016/j.carbon.2018.10.093; *Surface structure of few layer graphene* https://doi.org/10.1016/j.carbon.2018.04.089