Editorial

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It is well known that biological matter adheres tightly to surfaces; the phenomenon is usually coined *biofouling*. It concerns non-specific protein adsorption or bacteria biofilm formation, among other processes. For example, a medical device or an implant that contacts blood undergoes non-specific protein adsorption, which is the critical first event that initialises platelet adhesion and activation, blood coagulation and, finally, the thrombus generation. As far as bacterial biofilm formation is concerned, it is the final step to a sequence of phenomena starting with transport to the surface, followed by initial adhesion, attachment and quorum sensing-driven colonisation. Biofilms are not only extremely hard to remove, but they can provoke nosocomial disease if they occur in a hospital environment. These surface phenomena can be tackled with surface engineering strategies, which rest on the understanding of molecular interactions operating at the material and biomolecule or cell interfaces.

In this special issue, we address antifouling and related engineered surfaces through two reviews and three original research papers. We tackle state of the art in plasma surface functionalisation and surface chemical modification of monolithic stationary phases. The three research papers describe very distinct strategies for the making of antifouling surfaces based on surface-initiated photopolymerisation, a combination of mechanical polishing and silanisation of steel and, finally, application of an epoxy coating.

Bhatt *et al.* summarise the current research on plasma (co) polymerisation of different organic precursors for surface modifications of a variety of substrates in order to tailor the physico-chemical properties of the substrates for tuneable biomolecule–surface interactions.¹ The major part of the work presented focuses on the low-pressure inductively excited plasma-enhanced chemical vapour deposition of organic precursors for the functionalisations of material. In the second part of the article, an open-air custom-made atmospheric-pressure dielectric barrier discharge plasma jet is discussed for antifouling applications. This special focus aims to elaborate the state of the art of different low and atmospheric pressure plasma-deposited polymers for anti-fouling applications, cell–surface interactions and tissue engineering applications.

In the second review paper, Guerrouache *et al.* summarise strategies for the design of monoliths bearing hydrophilic surfaces for *in vitro* biomedical sample analysis.² The emphasis is on the control of surface composition of the monoliths. The authors describe the

single- or multi-step design and implementation of monoliths, and their hydrophilic and biocompatible characteristics. The review then addresses the application of monoliths as micro-column stationary phases for chromatography and electrochromatography by considering hydrophilic interactions and/or ion-exchange phenomena. The recent literature indicates important developments of nanoparticle-decorated monoliths; clearly these hybrid monoliths are expected to attract more researchers and will thus expand in the very near future.

As far as antifouling/bactericidal coatings are concerned, Ben Slama *et al.* grafted polymer/silver nanoparticle hybrid films onto gold- and indium-tin-oxide-coated glass modified by aryl diazonium salts bearing a photoinitiator group.³ Diazonium surface chemistry expanded recently and the authors take advantage of its versatility to graft robust antifouling nanocomposite thin films directed against the pathogenic bacteria *Listeria monocytogenes* ATCC 19115 and *Staphylococcus aureus* ATCC 25923. Viable attached cells were quantified by a colorimetric method. The hydrophilic polymer grafts served as antifouling coatings whilst the attached silver nanoparticles imparted a bactericidal character to the so-designed hybrid surface.

Instead of polymer grafting, surface morphology can be uniformly shaped like lotus leaves. In this way, Vanithakumari *et al.* developed superhydrophobic surfaces on marine steels to inhibit biofouling.⁴ Low-alloyed steel was modified using mechanical polishing, shot blasting, grit blasting, glass bead blasting and pickling, and coated with a low-surface energy material such as silane. The resultant steel surfaces were found to be superhydrophobic with apparent advancing water contact angles around 150° and tilting angles less than 5°. The surface-modified marine steels resisted biofouling.

Dhanapal *et al.* focus on the development and characterisation of modified epoxy and glycidyl carbamate coatings.⁵ The coatings were applied on mild steel and cured. The corrosion- and fouling-resistant behaviour of these coatings in comparison with a commercially available paint was determined by potentiodynamic polarisation, electrochemical impedance spectroscopy, scanning electron microscopy and antifouling studies. These coatings exhibited dual corrosion and fouling resistance.

From the above, this themed issue of *Surface Innovations* on antifouling and related engineered surfaces provides current

innovative methods for the making of antifouling surfaces. We anticipate that it would be of interest for students and researchers interested in antifouling surfaces.

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