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Scalable plasma chemical deposition of functional nanocoating

The worldwide market for functional surfaces exceeds $100 billion per annum (US Department of Energy). A key driver is the added value that can be imparted to commercial products through the molecular engineering of their surface properties. For example, the cleanliness of optical lenses, the feel of fabrics, the resistance of biomedical devices to bacteria, the speed of computer hard disks, and even the wear of car brake pads is all governed by their surface properties. The fabrication of such surfaces requires the incorporation of specific functional groups; for which there exists no shortage of potential methods including: S elf-assembled monolayers (SAMs), Langmuir-Blodgett films, dip-coating, grafting, chemical vapour deposition, to name just a few. However, such techniques suffer from drawbacks including substrate-specificity cannot be easily adapted to different materials or geometries and environmental concerns associated with the utilization of solvents, strong acid / base media, or heat. A range of innovative plasma chemical approaches will be described for the tailoring of solid surfaces. Applications will include: Super-repellency, non-fouling, anti-fogging, thermoresponsive, rewritable bio arrays, opto-chiral, antibacterial, electrical barrier, water harvesting, capture and release, oil-water separation, and nano-actuation.

Biography

Jas Pal Badyal has completed his BA, MA and PhD degrees from Cambridge University; where he subsequently held King's College and Oppenheimer fellowships. He is the primary author and inventor of 175 peer reviewed journal publications and 41 patent families. He has been recipient of the Royal Society of Chemistry Harrison Prize; the British vacuum council Burch Prize; the International Association of Advanced Materials Medal; and in 2016 he was elected as a fellow of the Royal Society - UK and Commonwealth National Academy of Sciences. His research has led to three successful start-up companies: Surface Innovations Ltd; Dow Corning Plasma Ltd; and P2i Ltd.

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