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Bioinspired surfaces for water collection and purification

The United Nations estimates that over one in ten people across the world do not have access to clean water. Hence, affordable, eco-sustainable methods for water collection and purification are a major global challenge the society is facing today. Within this context, the understanding of water droplet impact upon solid surfaces is an important phenomenon (as well as for other technological applications such as rapid cooling, freezing, crop spraying and inkjet printing). The impact and wetting of water droplets onto bioinspired three-dimensional hierarchical surfaces has been investigated using high-speed imaging to show that variation of surface topographical length scales can be utilized to control the dynamics of droplet impact. For water collection, it has been found that the three-dimensional hierarchical length scale structures of the *Cotula fallax* plant comprising stems, leaves, and fine hairs, capture and steer water droplets during fog episodes. In the case of the coniferous tree, *Thuja plicata*, remarkable water channeling properties are observed relating to the hierarchical macro surface structure of the plant, which can be easily replicated into meshes. Alongside water collection, three-dimensional hierarchical surfaces have also been developed for the capture and release of agricultural and heavy metal water pollutants, the killing of bacteria, and oil-water separation. Envisaged societal applications include water harvesting and low cost breathable architecture for developing countries.

Biography

J P S Badyal was awarded BA/MA (1985) and PhD (1988) degrees from Cambridge University; where he subsequently held a King's College Fellowship and the Oppenheimer Fellowship. In 1996, he was promoted to Full Professor at Durham University. He has 171 publications and 37 patents. Notable honours include the Harrison Prize, The Royal Society of Chemistry; the Burch Prize, The British Vacuum Council; and the IAAM Medal, International Association of Advanced Materials. His research has led to 3 successful start-up companies: Surface Innovations Ltd.; Dow Corning Plasma Ltd.; and P2i Ltd. (2015 International Business Award for 'Most Innovative Company in Europe').

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