



Surface Engineering – Learning from Nature

Abstract

Advances in technology have allowed us to better understand the chemical composition and structural architecture of natural biological systems. Biological interaction, from the simplest movement of water on surfaces to protein and cell interactions, is now understood to be highly governed by micro and nano-scale domains which are constructed naturally in biological systems. Using engineering approaches to form biomimetic surfaces we have the ability to better control fundamental interaction at the molecular level. Such control will drive the development of surfaces across a broad range of uses: microfluidic lab-on-a-chip devices, sensing surfaces for diagnostics, protein adsorption mediating cell adhesion; differentiation, and drug delivery to name a few examples within the field of biomedicine. In this seminar I will give an overview of surface engineering in this area with particular focus on protein-surface and cell-surface interaction to control biological responses.

Biography

My research interests lie within surface science and sensing technologies, mainly for biotechnological applications but also, more broadly, in the design of novel materials and sensing systems. During previous projects I have worked closely with others from different disciplines paving the way for numerous collaborations and developing my awareness and knowledge base in areas such as biological recognition, surface patterning, controlled wetting of surfaces, microfluidics and acoustic modulation of nanostructures.

Obtaining an MChem Chemistry degree in 2002 after completing a year study and research project at Kansas State University, USA, I then undertook a Ph.D. in Chemistry towards the investigation of protein interaction with chemically and topographically defined nano-surfaces. In 2005 I took an EPSRC funded postdoctoral research position in the physics team at Nottingham Trent University, developing acoustic sensors for biochemical sensing. I then broadened my understanding within the biological discipline, taking an MRC funded postdoctoral research position at the University of Nottingham, working between the Schools of Pharmacy and Biomedical Sciences, using a combinatorial approach to examine the effects of surface cues on cell interaction. In this time he had the opportunity to combine my interests of materials science and biological-surface interaction, developing skills in cell culture methodology.

Being appointed as Lecturer in the Institute of Science and Technology in Medicine at Keele University in 2009 my current research interests build upon my background in chemistry and knowledge of materials and biological interactions; developing novel biologically active materials for wound care / wound management through iterative design and investigation of biological responses.