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# MATERIALS SCIENCE AND NANOTECHNOLOGY

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### Advanced biomedical technologies facilitated by plasma polymers

In my talk, I will present recent progress from my lab in generating advanced biomedical technologies such as antibacterial surfaces, drug delivery platforms, cell guidance surfaces and cancer diagnostics. One problem that we intensively tackle is the undesired bacterial adhesion to medical device surfaces, which is a significant medical problem. We have created four classes of antibacterial surfaces, based on their mode of action, settable for application on a range of medical devices. Important for applications, we not only extensively test our coating for their antibacterial efficacy against medically relevant pathogens and isolates but also evaluate their potential cytotoxicity to mammalian cell and tissue, and potential inflammatory consequences. I will also outline our work on developing advanced nanoengineered plasma polymer coatings capable of directing cellular behavior including adhesion, proliferation, differentiation and migration. Using our technologies, we are capable of controlling and tailoring the entire spectrum of surface properties including chemistry, wettability, ligand densities, nanomechanics and nanotopography in a substrate independent fashion. I will demonstrate how we use surface gradients of nanoparticles density to study the influence of surface nanotopography on the behavior of various cell types, including immune cells. We are also capable of guiding the differentiation of stem cells by tailoring surface chemistry, nanotopography or density of signaling molecules. A recently developed device for selective cancer cell capture for complex liquids will also be presented.

### Biography

Krasimir Vasilev has completed his PhD at the Max-Planck Institute for Polymer Research in Mainz. He is currently an NHMRC Fellow and a Humboldt Fellow, and a Full Professor at the University of South Australia. He is the author of more than 180 publications, 5 patents and has been awarded in excess of 20 million dollars of research funding. He has received various honors and awards such as the John A Brodie Medal for achievements in Chemical Engineering in 2016 and the International Association of Advanced Materials Medal (IAAM medal) for contributions to the field of Advanced Materials and he was also elected a Fellow of the Royal Society of Chemistry.

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