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Multi-pores; controlling and measuring the flow of charged species through tunable nanopores producing a rapid, multiplex assay

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Point-of-need analytical devices have important applications in environmental, food security, forensic, biological warfare and the outbreak of contagious disease. Such sensors save time, overheads and lives, and to meet this demand a variety of technology platforms have emerged. Nanopore technologies offer single particle analysis, being used to sequence DNA, detect proteins, cells or nanomaterials. They even offer controlled and preferred ion flow enabling current rectifiers and ion sensors. Changing the size, length and shape of the pores has enabled a range of analytes to be quantified and characterised. Here, we present some of our recent work developing multiplexed assays using aptamer modified nanomaterials and pores to compare the use resistive pulses or rectification ratios on a tunable pore platform. We compare their ability to quantify the cancer biomarker Vascular Endothelial Growth Factor (VEGF). Secondly, by tuning the ligands and the setup, we then show how the translocation speed, conductive and resistive pulse magnitude, can be used to infer the surface charge of a nanoparticle, and act as a specific transduction signal for the binding of metal ions to ligands on the particles surface, used to extract and detect copper (II) ions (Cu^{2+}) from solution. Finally, we show data from samples that contain bacteria and bacteriophage and strategies to quickly quantify them.

Biography

Mark Platt completed his graduation and PhD at University of Manchester. He has developed an interdisciplinary research team investigating nanomaterial synthesis, characterization and electroanalytical sensors. He is currently a Senior Lecturer in Analytical Science developing portable diagnostic technologies via the integration of nanomaterials, fluidics and aptamers into nanopore sensors. He has published more then 35 peer review papers, and is a member of East Midlands Biomedical Research Unit–Diet, lifestyle and physical activity and an Academic Member of Collaboration for Leadership in Applied Health Research and Care, East Midlands.

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