NANOROD EPD: A VIABLE ROUTE TO LAYER-BY-LAYER ASSEMBLY WITH APPLICATION TO SOLAR CELLS, PHOTONICS AND BATTERIES

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The organisation of semiconductor nanorods into orthogonal and close packed arrays is of significant interest in a range of applications where discrete properties of individual nanorods are needed in high density. Their collective assembly is widely sought for photovolatics, nanophotonics and batteries. Here I describe the use of electrophoresis to assemble nanorods from organic solvents onto a substrate where each rod is axially oriented and close packed. I will show how the crystal structure of the nanorods and their ligand shell has an important influence on their orientation behaviour under the influence of the applied field with respect to dipole moment and total net charge. The rod assembly by EPD is generally applicable provided a tight control of nanorod dimensions are achieved and in this work a range of nanorod assemblies are shown from semiconductors CdS, CdSeS and Au metal rods (Figure 1) that are of interest in photonics, $CuIn_xGa_{1-x}S$ and Cu_2ZnSnS_4 nanorods for photovoltaics and SnS nanorods as conversion anodes in lithium ion batteries. The talk will show the importance of EPD as a viable route for the rapid formation of functional layers, with a high degree of control of nanorod packing and orientation, which can be exploited for a range of device applications.

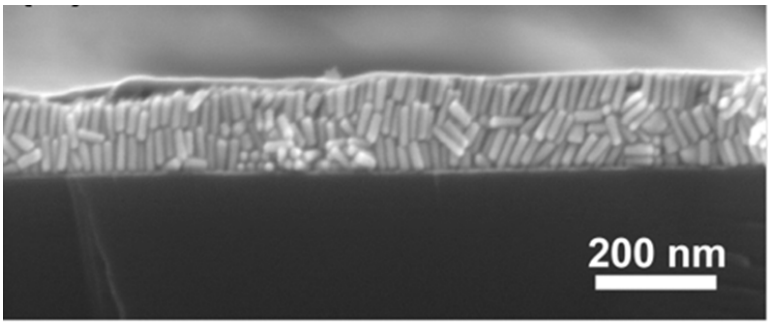

Figure 1 – Cross section SEM image of Gold Nanorods vertically aligned by EPD