



**Tuesday 8 September, Session 2, 16:00 – 16:20**

## **Structural colour using cellulose nanofibers**

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This talk will present some recent work on the assembly and optical characterisation of structurally coloured films using cellulose nanocrystals and other materials. The two basic approaches used are layer-by-layer deposition (LbL) of anionically charged cellulose nanocrystals (CNCs), produced by sulphuric acid hydrolysis, and cationically charged clay and the controlled drying of water/CNC droplets. To form structurally coloured films using LbL two different layers, of low and high refractive index, are formed [1]. For the low refractive index layers a combination of colloidal silica and CNCs were combined. To form a high refractive index layer, polyethyleneimine (PEI) was combined with Vermiculite (VMT). Sequential dipping in each of these solutions led to the formation of multilayered Bragg stacked films. The talk will present the theory of Bragg stack reflectors and show how both natural and synthetically produced materials can give rise to structural iridescence. Alternatively we also investigated the drying of concentrated droplets of CNCs in water on a range of different substrates. A range of behaviour is reported across a droplet. Structural colour is observed in different regions of the droplet and within dried films of material. We show evidence of both left and right reflected circularly polarised light, suggesting similar chiral structures within the dried droplet films, contrary to most previous studies of these materials.

- [1] Tzeng, P., Hewson, D.J., Vukusic, P., Eichhorn, S.J., Grunlan, J.C. 2015. Bio-Inspired Iridescent Layer-by-Layer-Assembled Cellulose Nanocrystal Bragg Stacks. *Journal of Materials Chemistry C*, 3, 4260-4264