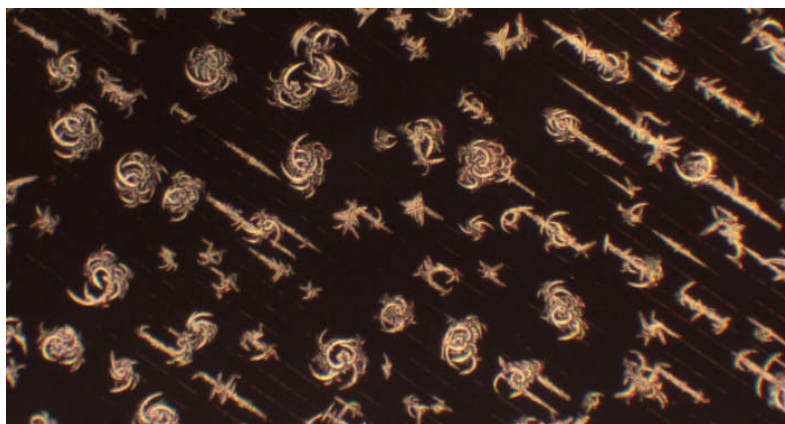


Crystallisation in Confinement

Dr Hugo Christenson



On the strength of preliminary studies^{1,2} we have recently been awarded a £1 M EPSRC grant to investigate topographical control of crystallisation, in collaboration with the School of Chemistry and the School of Earth and the Environment. Ion-beam milling and lithographic techniques will be used to pattern surfaces with submicron grooves and pits and we will study the effect of these on crystallisation from vapour, solution and the melt (i.e. freezing of liquids). In a parallel research program we have been carrying out experiments on the crystallisation of biominerals like calcium carbonate^{1,2} (sea shells, sea urchins) hydroxyapatite³ (bones and teeth) and calcium sulfate⁴ (statoliths) confined between two surfaces at submicron separations. We have identified a range of kinetic effects on the crystallisation which stabilise the amorphous precursor phases commonly found with biominerals. There are a number of Ph.D. projects available in relation to confinement and topography effects on nucleation and crystallisation. These include studies of surface and confinement effects on protein aggregation and crystallisation, crystallisation of inorganics and pharmaceuticals in porous media such as Vycor glass and zeolites, and ice nucleation on patterned surfaces. The project will give ample opportunity to learn techniques like Scanning and Transmission Electron Microscopy, Atomic Force Microscopy, Raman Spectroscopy, X-ray Diffraction, Calorimetry and Thermo-Gravimetric Analysis.



Camphor crystals growing from vapour in grooves ion-beam milled in silicon wafer

1. Holbrough, Campbell, Meldrum, Christenson *Cryst. Growth Des.* 12, 750 (2012).
2. Campbell, Meldrum, Christenson *Cryst. Growth Des.* 13, 1915 (2013)
3. Stephens, Ladden, Meldrum, Christenson *Adv. Funct. Mater.* 20, 2108 (2010).
4. Stephens, Kim, Evans, Meldrum, Christenson *J. Am. Chem. Soc.* 133, 5210 (2011).
5. Wang, Christenson, Meldrum *Adv. Funct. Mater.* 23, 5615 (2013).
6. Wang, Christenson, Meldrum *Chem. Mat.* 26, 5830 (2014).

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