



Controlled Structure Formation in Thin Films

Ullrich Steiner

BSS

Biological and Soft Systems

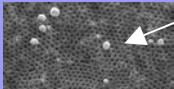
Nanoporous Block copolymer templates

Tapping Mode AFM



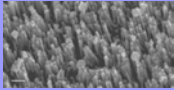
Hole Diameter 15 ± 4 nm
Centre-to-Centre Distance 28 ± 2 nm

SEM (uncoated)



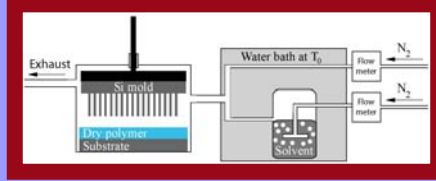
Wire overgrowth

SEM (uncoated)



Cu₂O hole conductor
Wire Diameter = 20 ± 2 nm
Density 1.5×10^{11} cm⁻²

Solvent vapour assisted imprint lithography



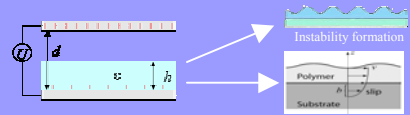
Micro and nano-structuring of polymer based materials in a controlled solvent atmosphere



Nanostructures
Polystyrene
552 kg/mol

Dynamics of pattern formation

Study of the flow of a liquid polymer melt destabilised by an electric field can give information about slip and about the hydrodynamics of the thin film near the interface.



Optical images

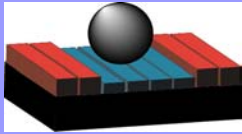


AFM images

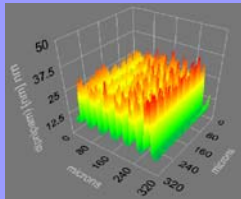


RMS: 0.81 nm RMS: 4.57 nm RMS: 9.10 nm

Polymer brushes for load transport

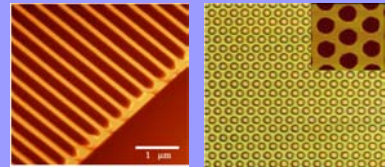
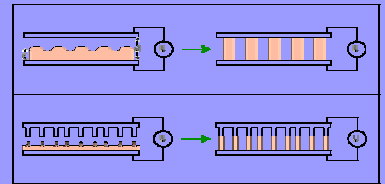


Localised conformational changes for directional small-scale transport



Pattern Formation in functional thin films

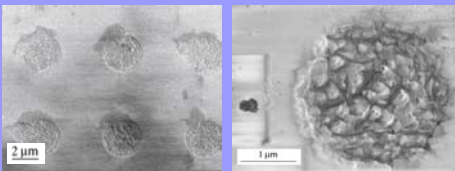
Pattern replication using electric fields



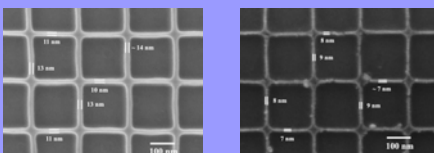
100 nm lines replicated by an electric field

Soft lithography of hard materials

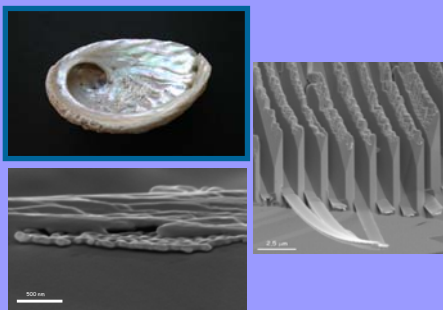
ZnO grown in the PS holes



Direct writing of Ni naphthenate

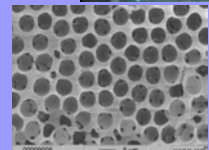


Bio inspired polymer inorganic hybrid materials



Self-cleaning surfaces

Manufacture corrugated Teflon® surfaces which are ultra hydrophobic and repel dirt



SEM picture of a surface consisting of Teflon® colloids. The Teflon® colloids are 200 nm in size

For more information contact: u.steiner@bss.phy.cam.ac.uk
www.bss.phy.cam.ac.uk/steiner

OR

Sector Administrator Tracy Inman Room 251 ext 37007 tiz21@phx.cam.ac.uk



Rijksuniversiteit Groningen



Biological and Soft Systems

