**Nanoscale Fibres via Electrospinning**

Geoffrey Mitchell

University of Reading, Reading RG6 6AF UK

Email: g.r.mitchell@reading.ac.uk

Electrospinning is a technique, which can produce fibres with diameters ranging from nanometres to a few microns. The process involves the transformation of a solution in to a solid on a sub-second time-scale. The technique can be exploited with both synthetic and biological macromolecules. These fibrous materials offer a diversity of applications including filtration, membranes, tissue engineering scaffolds, replacement nerves, sensors, optical devices and drug delivery.

Electrospinning generates nano and micro-scale polymer fibres by means of applying an electric field to droplets of polymer solution passed from tip of a fine orifice. As a consequence of Coulombic forces, a droplet of the solution of a polymer will become charged; as a consequence its shape will become distorted to form a cone-like geometry and subsequently the integrity of the droplet will break down and a fibre of polymer will be produced and deposited on a collector.

We show how the electrospinning process can be modified to produce highly aligned arrays of fibres, how the spinning parameters influence both the size and morphology of the fibres and how we can use this control to define the molecular organisation of the electrospun fibres. We have used a variety of electron microscopy, x-ray scattering and neutron scattering techniques to probe this internal structure in synthetic, virtual and naturally occurring polymers. We signpost future challenges and applications.