Mesoporous Colloidal Gels for Optical Applications - Synthesis and Characterisation

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One of the key drawbacks of equilibrium self-assembly as a fabrication technique for novel microstructures is the requirement for a given system to achieve its ground state. The avoidance of kinetic traps which prevent a mixture from coming to equilibrium has proven experimentally challenging[1]. However, by promoting kinetic arrest via introduction of additional binding mechanisms, it becomes possible to fabricate a wide range of new amorphous or mesoporous materials. By varying the shape and size of particles and the strength of the inter-particle interactions, the characteristics of these arrested phases can be tuned. Such materials would have possible applications in photovoltaics, batteries, and optics[2].

We use DNA-coated polystyrene colloids as building blocks to assemble these non-equilibrium phases. Here we discuss the synthesis of these microstructures and characterise them using structure factor and chord analysis (Figure 1). In particular, we discuss the dependence of the microstructure achieved on particle size and volume fraction for comparison with theoretical results.

![Micrograph](image1.png)

Figure 1: (Left) Micrograph of a typical gel of DNA coated colloids, taken on a confocal microscope using a dye attached covalently to the particle surface. (Right) The same image processed to highlight colloid rich and poor phases for lengthscale analysis.

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