Packing and stacking of squishy colloids

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Systems of microgel particles, polymer gels of colloidal dimensions which are swollen in a solvent, form an interesting hybrid between polymeric and colloidal soft materials. This duality in behavior can be exploited to sensitively tune their mechanical and optical properties, interactions and responsivity to external triggers. This gives rise to new possibilities to create microstructured materials and to study the physics of soft and squishy matter.

In this talk I will highlight some of our recent work in the synthesis and study of microgel systems in bulk and at liquid interfaces. I will, for example, show how we use microgels to study the classical problem of the packing of spheres of unequal size, where we surprisingly find that mixtures of particles at a size ratio previously thought to be an ideal glass former, actually allows co-crystallisation at low doping fractions by the formation of a new type of substitutional defect. I will also discuss how microgel particles spontaneously yet irreversibly anchor to a wide variety of liquid interfaces and how the interactions between the particles at these interface can be changed from isotropic to quadrupolar, giving rise to the formation of aligned fractal clusters and non-close packed square crystals.