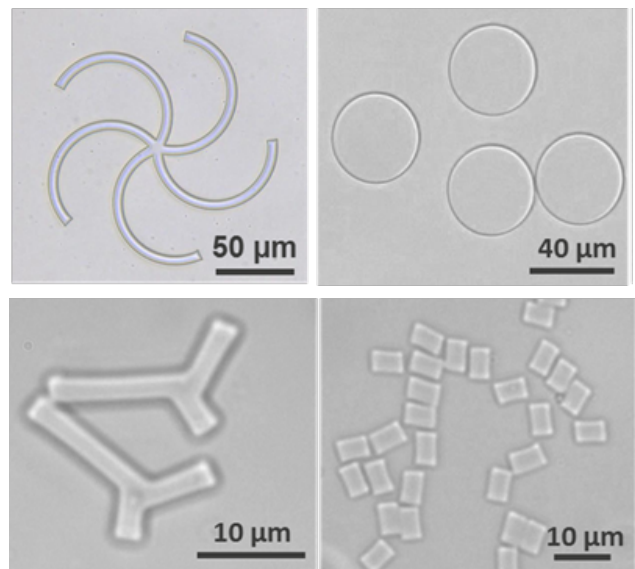


## Open Master Thesis Project

### Title: Non-equilibrium thermodynamics of driven microgel systems

**Motivation:** Microgels are cross-linked polymeric networks with dimensions ranging from several hundreds of nano- to a few tens of micro-meters. Microgels are highly sensitive to the environmental changes and can change swelling behaviour (shape and volume) in response to external stimuli such as temperature, pressure, pH, and ionic strength. This ability has attracted a lot of attention due to potential applications as micro-sensors, micro-actuators, micro-valves and drug delivery devices. For microgels with a complex shape placed in the gradient of a stimulus field, the volume change is coupled to complex deformation patterns and provides an opportunity to reversibly tune microgels' physical properties. Most interesting behaviour of temperature-responsive microgels is expected then microgels are driven far from equilibrium. Theoretical description of such a system requires development and application of appropriate non-equilibrium thermodynamic models.

Microgels of different shapes



#### Tasks:

- to develop non-equilibrium thermodynamic model of thermo-responsive microgels
- to develop numerical implementation of the model
- to study dynamics of microgels driven far from equilibrium
- to analyse influence of phase separation and associated mechanical instabilities on the microgel dynamics

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