

Self-assembly of Saturn Particles in Two-Phase Systems

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The self-assembly of particles can lead to building blocks for new materials with novel properties [1]. To guide the self-assembly, particles are functionalized with patches. We functionalize the caps of round particles with patches, separated by the belt, and call them Saturn particles [2]. Most often in literature, these particles preferably interact with each other with their patches [3,4].

The used Saturn particles are produced by masking the belt region of the particles by float-casting with a soluble polymer. The caps are released from the polymer by plasma etching with oxygen plasma and are covered with gold by sputter coating. After solving the polymer, the Saturn particles with gold caps (see Figure 1) can be harvested.

Saturn particles do not show any self-assembly when added to a one-phase system (neither in a hydrophilic nor hydrophobic solvent). When dispersed in the right mixture of hydrophilic and hydrophobic solvent, Saturn particles connect via the belt (see Figure 2a and 2b) and form branches and chains. Dependent on the mixture and energy input, huge networks are formed (see Figure 2c).

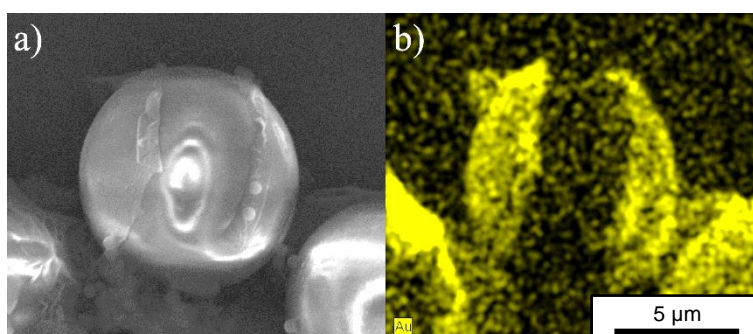


Figure 1. a) SEM image of a single Saturn particle. b) EDX spectral map of gold for a selected area of a single Saturn particle.

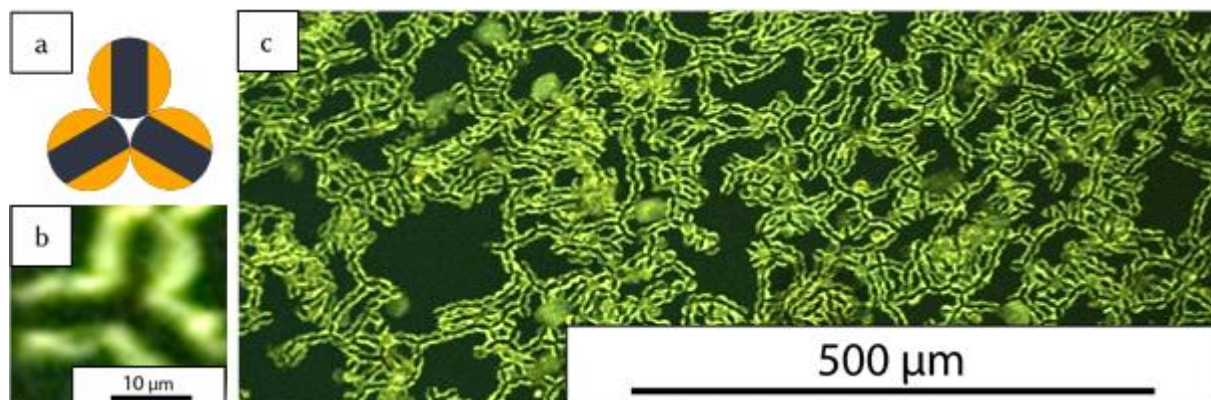


Figure 2. Via belt connected Saturn particles at oil-water-interfaces. a) Sketch b/c) Confocal fluorescence microscopic image. The caps of Saturn particles show a fluorescence signal – the belt does not.

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