

**Colloquium of the International  
Graduate Research Training Group I524 – SSNI –**

**Self-Assembled Soft-Matter Nanostructures at Interfaces**



**Friday, July 25<sup>th</sup>, 2014, 10.00 h  
Technische Universität Berlin  
TC building, room TC 014  
Strasse des 17. Juni 124, 10623 Berlin**

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### **Design principles for multiple droplets within droplets**

Multilayered emulsions with an “onion” topology are useful vehicles for drug delivery, biochemical assays, and templating new materials. They can be assembled by ternary liquid phase separation using microfluidics, but the control over their design is limited because the mechanism of their creation remains unknown. Here we show that phase separation occurs via self-similar cycles of mass transfer, spinodal decomposition or nucleation, and coalescence into concentric inner layers stabilized by a surfactant. This process results in a linear relationship between consecutive layer diameters, which limits their multiplicity for a given droplet size. The ratio of diameters increases as the ternary composition approaches the critical point, giving rise to quintuple emulsions. Controlling phase separation allows us to scale the method up to bulk production via membrane emulsification and to devise self-assembly routes for polymer capsules and liposomes. Moreover, we extend the technique to tune the non-spherical shape of particle-stabilized droplets and to assemble droplets with ordered internal structures.

We cordially invite everybody who is interested.

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