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Surface Roughness directed Self-Assembly of Patchy Particles into Colloidal Micelles DANIELA KRAFT, Center for Soft Matter Research, New York University, RAN NI, FRANK SMALLENBURG, MICHIEL HERMES, Soft Condensed Matter, Utrecht University, KISUN YOON, DAVID WEITZ, Experimental Soft Condensed Matter Group, Harvard University, ALFONS VAN BLAADEREN, Soft Condensed Matter, Utrecht University, JAN GROENEWOLD, Van 't Hoff Laboratory for Physical and Colloid Chemistry, Utrecht University, MARJOLEIN DIJKSTRA, Soft Condensed Matter, Utrecht University, WILLEM KEGEL, Van 't Hoff Laboratory for Physical and Colloid Chemistry, Utrecht University — Self-assembly of colloidal particles into larger structures bears potential for creating materials with unprecedented properties, such as full photonic band gaps in the visible spectrum. Colloidal particles with site-specific directional interactions, so called "patchy particles," are promising candidates for bottom-up assembly routes towards such complex structures with rationally designed properties. Here we present an experimental realization of patchy colloidal particles based on material independent surface roughness specific depletion interactions. Smooth patches on rough colloids are shown to be exclusively attractive due to their different overlap volumes. We discuss in detail the case of colloids with one patch that serves as a model for molecular surfactants both with respect to their geometry and their interactions. These one-patch particles assemble into clusters that resemble surfactant micelles. We term these clusters "colloidal micelles." Similarities as well as differences between the colloidal model system and molecular surfactants are discussed and quantified by employing computational and theoretical models.

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