Learning how to shape bits of matter into precise microscopic geometries and to impart them with well-defined functionalities is essential for unlocking the full potential of colloidal self-assembly towards bottom-up microfabrication. In this work, we exploit wetting phenomena at the nano- and micron-scale to develop a new synthetic platform for colloidal engineering. Particles with reconfigurable shapes and asymmetric compositions are synthesized in bulk quantities via an emulsion-based method. Solid seeds are first encapsulated inside polymerizable microdroplets and then systematically dewetted to yield a new class of reconfigurable colloids. We demonstrate dewetting of the oil phase from solid seeds under light or chemical stimuli, depending on the nature of the seed particle. We tested the method on a broad spectrum of substrates including polymers, inorganic semiconductors, and magnetic materials. We also show that by iterating this two-step encapsulation and dewetting process, increasingly complex geometries can be reproducibly engineered. This synthetic methodology represents a new and general tool for designing and rapidly prototyping functional colloids, such as micro swimmers, colloidal surfactants, and dynamically reconfigurable building blocks for self-assembly.

References