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Interfacial complexation in microfluidic droplets for single-step fabrication of microcapsule GILAD KAUFMAN, Yale Chemical Engineering, SIAMAK NEJATI, University of Nebraska-Lincoln, RAPHAEL SARFATI, ROSTISLAV BOLTYANSKIY, DANIELLE WILLIAMS, WEI LIU, ASHLEY SCHLOSS, LYNN REGAN, ELSA YAN, Yale, ERIC DUFRENSE, ETH Zurich, MICHAEL LOEWENBERG, CHINEDUM OSUJI, Yale — We present microfluidic interfacial complexation in emulsion droplets as a simple single-step approach for fabricating a large variety of stable monodisperse microcapsules with tailored mechanical properties, protein binding and controlled release behavior. We rely on electrostatic interactions and hydrogen bonding to direct the assembly of complementary species at oil-water droplet interfaces to form microcapsules with polyelectrolyte shells, composite polyelectrolyte-nanoparticle shells, and copolymer-nanofiber shells. Additionally, we demonstrate the formation of microcapsules by adsorption of an amphiphilic bacterial hydrophobin, BslA, at oil-in-water and water-in-oil droplets, and protein capture on these capsules using engineered variants of the hydrophobin. We discuss the composition dependence of mechanical properties, shell thickness and release behavior, and regimes of stability for microcapsule fabrication. Nanoparticle based microcapsules display an intriguing plastic deformation response which enables the formation of large aspect ratio asperities by pipette aspiration of the shell.

Gilad Kaufman
Yale Univ

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