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Dewetting instability during formation of polymerosomes from block-copolymer-stabilized double emulsions RYAN HAYWARD, University of Massachusetts, Amherst, ANDREW UTADA, DAVID WEITZ, Harvard University — We study the formation of polymer vesicles, or polymerosomes, from double emulsion droplets of controlled architecture produced via a microfluidic device. A volatile organic solvent containing an amphiphilic diblock copolymer is employed as the middle phase of a water-in-oil-in-water emulsion. The block copolymer assembles at the oil-water interfaces, stabilizing the interior water droplet against coalescence with the exterior aqueous phase. Upon evaporation of the organic solvent, a thin vesicle of the block copolymer is formed. We find that the presence of excess diblock copolymer in the oil phase gives rise to a dewetting phenomenon, in which the shrinking oil droplet partially wets a thin film of solvated block copolymer. This yields acorn-like morphologies similar to those commonly encountered in systems of three immiscible fluids, ultimately resulting in an inhomogeneous polymerosome structure. We propose that the dewetting may be driven by a depletion effect due to the excess diblock copolymer.

Ryan Hayward
University of Massachusetts, Amherst

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