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Free-Standing Temperature-Sensitive Hydrogel-Particle Membranes from Evaporating Drops[1] TIM STILL, Department of Physics and Astronomy, University of Pennsylvania, Philadelphia, PA 19104, PETER YUNKER, School of Physics, Georgia Institute of Technology, Atlanta, GA 30332, KEVIN APTOWICZ, Department of Physics, West Chester University, West Chester, PA 19383, KASEY HANSON, ZOEY DAVIDSON, MATTHEW LOHR, A.G. YODH, Department of Physics and Astronomy, University of Pennsylvania, Philadelphia, PA 19104 — We demonstrate a simple method using evaporating colloidal drops to prepare temperature-sensitive membranes composed of micron-sized colloidal hydrogel particles that are up to a few particle diameters thick. Sessile droplets of hydrogel particle suspension were evaporated on silicon wafers. The radially outward flows that drive the common coffee-ring effect push hydrogel particles towards the drop edge wherein the particles attach to the air-water interface. Most of these microgel particles move radially inward along the interface and coat the drop surface. The particles are then cross-linked, forming a membrane. The resultant thin films exhibit a temperature-responsiveness characteristic of the individual particles, permitting modulation of membrane size, shape, and optical transmission. We understand the optical properties using a Mie scattering model and an assumed membrane structure.

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