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Tunable and Reversible Swelling of a p(tBA)-*b*-p(HEMA-*co*-DMAEMA) Block Copolymer KYLE GUICE, YUEH-LIN LOO, University of Texas at Austin — Hydroxyethyl methacrylate (HEMA) and dimethylaminoethyl methacrylate (DMAEMA) have been investigated as precursor materials for pH-responsive hydrogels. DMAEMA in these hydrogel systems allows for pH-tunability, as it is reversibly protonated below its pKa (7.5). In this work, we present the design of a nano-structured hydrogel diblock copolymer whose major block consists of a statistical copolymer of p(HEMA-*co*-DMAEMA) (30.5 kg/mol) polymerized at the azeotropic composition (71 mol% HEMA), with a poly(tert-butyl acrylate), p(tBA), (12.1 kg/mol) minor block. The resulting diblock copolymer is narrow in molecular weight distribution (PDI = 1.24) and spontaneously self-assembles to form hexagonally-packed p(tBA) cylinders (R = 9.5 nm) within a p(HEMA-*co*-DMAEMA) matrix in the solid state. When swollen in an aqueous medium, hydrophobic p(tBA) cylinders serve as physical cross-links. We monitor the extents of swelling by quantifying changes in the characteristic (10) spacing of the hexagonal lattice by SAXS. Swelling is tunable and reversible with changes in pH; we observe 35% and 21% swelling relative to the dry state at pH 5 and 8.5, respectively.

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