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Patterning of microgel particles on polymer surfaces controlled by autophobicity and interfacial tension ARIF GOZEN, BIN WEI, RICHARD SPONTAK, JAN GENZER, North Carolina State University, PAUL GURR, DAVID SOLOMON, GREG QIAO, University of Melbourne — We investigate the thermal response of microgel particles (μGPs) composed of a cross-linked divinylbenzene core and poly(methyl methacrylate) (PMMA) arms as they segregate from PMMA homopolymer due to autophobicity. When in contact with a free surface, the particles migrate to the PMMA surface but remain inside the PMMA. When a thin film of polystyrene (PS) is placed on top of a PMMA/μGP film, the μGPs segregate to and thus roughen the PMMA/PS interface, as evidenced by AFM analysis. We attribute this behavior to a change in surface vs. interfacial energetics. Specifically, while the high surface energy of the native PMMA film keeps the particles inside the bulk PMMA, placing a thin PS layer on top of the PMMA/μGP film decreases the PMMA/PS interfacial tension by about an order of magnitude, which consequently permits segregation of the μGPs to the PMMA/PS interface. We follow the segregation kinetics of core-shell μGPs with and without fluorescent tagging, and we demonstrate the possibility of patterning the segregated μGPs by contacting a corrugated poly(dimethylsiloxane) (PDMS) layer to PMMA/μGP films. Regions of the PMMA/μGP film touching the PDMS layer exhibit μGP segregation, while non-contacted regions appear featureless.

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