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First and second order volume-phase transitions in photo-cross-linked poly(cyclopropylacrylamide) and poly(N-vinylisobutyramide) coatings RYAN TOOMEY, LEENA PATRA, University of South Florida — The temperature-dependent swelling of thin (100 nm) coatings of photo-cross-linked poly(cyclopropylacrylamide), or poly(CPAAm), and poly(vinylisobutyramide), or poly(NVIBAm) was characterized. Both polymers contained 3 mole% of methacroylaminobenzophenone (MnBP) as the photo cross-linking unit. Poly(CPAAm-co-MnBP) showed a continuous, 2nd order deswelling transition between 10 and 70 °C with no hysteresis. Poly(NVIBAm-co-MnBP), on the other hand showed a discontinuous, 1st order deswelling transition at 45 °C with hysteresis. The differences in the swelling transitions can be interpreted within the context of the cloud-point measurements of the uncross-linked polymers. Whereas poly(NVIBAm-co-MnBP) has a significant off-zero critical point (> 10 wt% polymer) at 36 °C, poly(CPAAm-co-MnBP) has a critical point at zero concentration and 23 °C. Concurrent measurements of the infrared vibrations of the amide groups in both polymers further revealed that the amide group in poly(CPAAm-co-MnBP) maintains a constant hydrogen-bonding environment throughout the volume-phase transition. Poly(NVIBAm-co-MnBP), on the other hand, has a concentration-dependent hydrogen bonding environment around the carbonyl group, which is consistent with an off-zero concentration in the cloud point curve.

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