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Characterization of Poly (N-isopropylacrylamide) Gels by Ultra-Small Angle Scattering. Vijay R. Tirumala¹, L. Guo², P. Thiyagarajan², J. G. Barker³, G. T. Caneba⁴, and D. C. Mancini¹, ¹Advanced Photon Source, Argonne National Laboratories, Argonne IL, ²Intense Pulsed Neutron Source, Argonne National Laboratories, Argonne IL, ³National Inst. of Standards and Technology, Gaithersburg, MD, ⁴Dept. of Chemical Engineering, Michigan Technological Univ., Houghton, MI.

Poly (N-isopropylacrylamide) gels, prepared either by conventional chemical syntheses or radiation synthesis, possess rich porous morphology. Average pore-size of the gel networks ranges from a few nanometers to a few tens of microns and depends on several parameters such as reaction temperature, monomer and/or crosslinker concentration, and absorbed dose of radiation. Obtaining complete morphological information from such gels requires probing the gel structure over many orders of magnitude and, thus, many decades of wave vector. Ultra-Small Angle Scattering (both by x-rays and neutrons) was used to characterize the poly (N-isopropylacrylamide) gels prepared by synchrotron-radiation-induced polymerization. The characteristic length of the gel networks was found to range from 150 to 250 nm, depending on the monomer concentration and absorbed dose. The effect of absorbed radiation dose on the thermoresponsive behavior of the gels was also measured and related to their crosslink density.