Lower Critical Solution Temperature (LCST) Behavior of Poly(*N*-isopropylacrylamide) Grafted onto Clay Nanoparticles

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Abstract

It is widely known that the thermosresponsive poly(*N*-isopropylacrylamide) (PNIPAM) exhibits lower critical solution temperature (LCST) behavior at 32 ºC in aqueous solutions. To tune the LCST of PNIPAM to a broader temperature range offering a larger window of applications, in the present study, we investigate the effect of chemical grafting on the LCST behavior of the PNIPAM chains grafted onto clay surfaces (thus forming the PNIPAM polymer brushes) in co-solvents of deionized water and dimethyl sulfoxide. At specific ratios of co-solvents, the LCST of the grafted PNIPAM chains characterized by the wide-angle X-ray scattering (WAXS) was found to increase to around 45 ºC, which was significantly higher than that found for the corresponding neat PNIPAM homopolymer in pure deionized water. We propose that the significant increase in LCST observed in the PNIPAM-*g*-clay nanocomposite system may be attributed to that the chain shrinkage behavior of PNIPAM to a dehydrated state was greatly perturbed by the reduced chain mobility associated with their chain ends anchored onto the clay nanoparticles.

Keywords – PNIPAM、clay nanoparticle、LCST