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AN UNEXPLORED REMARKABLE POLY(N-ISOPROPYLACRYLAMIDE)-OSMOLYTE INTERACTION STUDY

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We investigate the aggregation and hydrophobic collapse of water soluble amphiphilic polymer, poly(N-isopropylacrylamide) (PNIPAM), in aqueous solution containing various additives such as trehalose, sucrose, sorbitol, urea, TMAO (Trimethylamine N-oxide) and their mixtures in varying ratios. The effect of these osmolytes on the coil to globular transition of the PNIPAM is studied by the use of comprehensive biophysical techniques like UV-visible and fluorescence spectroscopy, dynamic light scattering (DLS) and Fourier transform infrared spectroscopy (FTIR). The polarization induced by these additives makes the collapse of PNIPAM much faster as compared to PNIPAM in aqueous solution. The decrease in lower critical solution temperature (LCST) of the polymer with increase in the concentration of osmolyte is due to the significant changes in the interactions among polymer, osmolyte and water. The driving force for concomitant sharp configurational transition has been attributed to rupture of hydrogen bonds between water and polymer and to hydrophobic association of polymer. The results of the present study can be used in the bioresponsive smart PNIPAM-based devices. This tuning of LCST may help in various scientific areas to explore target specific applications of intelligent PNIPAM. The modified collapsed state in PNIPAM may provide sites for efficient drug encapsulation and their controlled release.

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