Coil-Globule Transition of PNIPAM in Non-Ionic Surfactant Mesophase

V.J. JIJO, NCL, Pune, India, K.P. SHARMA, R. MATHEW, R.R. RAJAMOHANAN, K. GURUSWAMY, NCL, Pune, India — We investigate the Coil-Globule transition of linear poly N-isopropylacrylamide (PNIPAM) in the hexagonal (H₁) mesophase of a non ionic surfactant, C₁₂E₉ in water, by Turbidimetry, NMR and SAXS. For aqueous PNIPAM, the LCST (coil-globule transition temperature), $T_{PNIPAM}$, is 35 °C, whereas the H₁ phase transitions to a micellar phase at a temperature, $T_{H₁}$, of 45 °C. As PNIPAM is added to the C₁₂E₉/H₂O system; depending on the ratio of C₁₂E₉:H₂O, $T_{PNIPAM}$ changes. It is observed that at 42wt% of C₁₂E₉ (viz. 58wt% water; micellar phase), the $T_{PNIPAM}$ is 33 °C. At 44wt% of C₁₂E₉ (viz. 56wt% water), the H₁ phase forms and the the coil-globule transition for PNIPAM starts at 28 °C. For 50wt% C₁₂E₉, the transition starts from 13 °C and for 60wt% C₁₂E₉ in water, PNIPAM does not even shows the phase transition even as below as 5 °C. It is observed using optical microscopy that the PNIPAM is trapped at the domain boundaries of the H₁ phase. The decrease in the coil globule transition temperature,$T_{PNIPAM}$, is not only because of the hydrophobic interactions but also due to the competition between polymer and C₁₂E₉ for water in the H₁ phase. The inability of PNIPAM to become a complete globule at higher temperature may be due to the adsorption of C₁₂E₉.

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