2C1a

How the interamolecular interaction affects the solubility of the acryl amide polymers

Yukiteru Katsumoto[1], Bojana Ginovska-Pangovska[2], Aida Misako[1], and Michel Dupuis[2]

1 Graduate School of Science, Hiroshima University

2 Pacific Northwest National Laboratory

Several researchers have suggested that the phase behavior of poly(*N*-substituted acrylamide) in water is significantly influenced by the tacticity. In order to reveal the tacticity effects on the phase behavior of the aqueous polymer solution, we have to complete the phase diagrams by using well-defined samples. In the present report, tacticity effects on the phase boundary of poly(*N*-isopropylacrylamide) (PNiPAm) and poly(*N,N*-diethylacrylamide) (PNdEAm) in water have been investigated. The stereospecific reversible addition-fragmentation chain transfer (RAFT) polymerization has been employed to prepare a set of well-defined polymer samples that have a similar M_n and M_w/M_n but a different meso diad (*m*) content. The phase boundary curve of PNiPA with a higher *m* content appears in a lower temperature region. The tacticity also gives an influence to the shape of phase boundary curves. On the other hand, the phase boundary curves for the stereocontrolled PNdEAms in water shifts to higher temperature with increasing *m*, and the shape of the phase boundary curve seems not to change depending upon the *m* value. Infrared spectra of the stereocontrolled PNiPAm and PNdEAm in water have indicated that the hydration state of amide groups is varied by the stereoregularity of polymer chains. These results indicate that (1) a *m*-rich PNiPAm is more hydrophobic, whereas a *m*-rich PNdEAm becomes more hydrophilic, (2) the hydration state of amide groups is correlated with the tacticity of these polymers, and (3) the interchain interaction of an atactic PNiPAm in water is stronger than that of an atactic PNdEAm. To investigate the tacticity effects on the hydrophilicity of the polymers at molecular level, the dimer model compound, *N,N'*-bis(1,1-dimethylethyl)-2,4-dimethyl-Pentanediamide, (DNiPAm), was synthesized. By measuring the distribution coefficient of DNiPAm in chloroform-water, we concluded that the solubility of the meso DNiPAm in water is lower than that of the racemo DNiPAm.

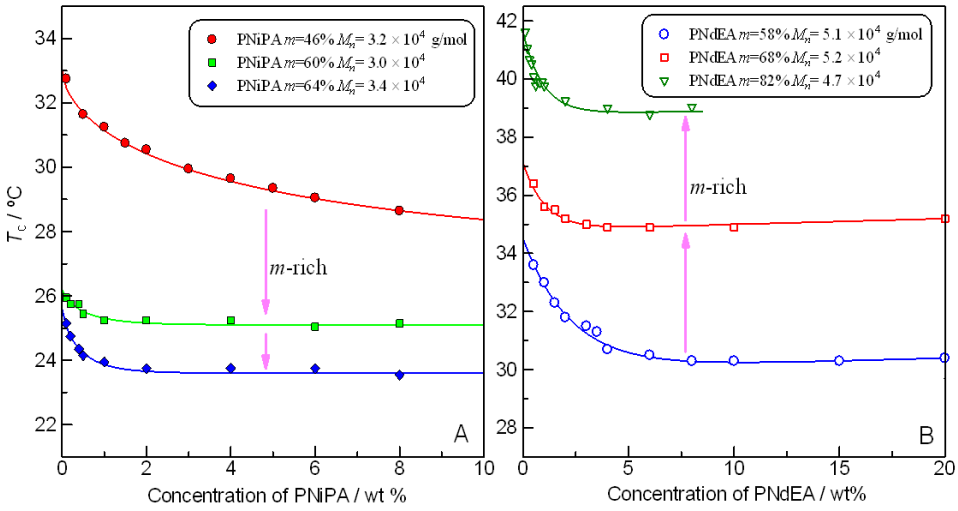

Fig.1. Tacticity effects on the phase boundary curve of PNiPAm and PNdEAm in water