SURFACTANT-SENSITIVE EPOXY HYDROGELS INVESTIGATED BY SMALL-ANGLE NEUTRON SCATTERING

Ivan Krakovský[a], and Noémi Kinga Székely[b]

[a] Department of Macromolecular Physics, Faculty of Mathematics and Physics, Charles University, V Holešovičkách 2, 180 00 Praha 8, Czech Republic
[b] Forschungszentrum Jülich GmbH, Jülich Centre for Neutron Science, Aussenstelle am FRM II, Lichtenbergstraße 1, 85747 Garching, Germany

Epoxy networks represent a very important class of industrial polymer materials due to a wide versatility of their structure and excellent mechanical properties. They are usually prepared by the reaction of diamino-functionalized prepolymer with a diepoxide. Using functionalized polyoxyethylene (POE) in the synthesis enables preparation of epoxy networks with controlled hydrophilicity. Hydrogels obtained by swelling of the hydrophilic epoxy networks containing POE in water have a nanophase separated structure consisting of water-rich and water-poor domains as evidenced by small-angle neutron scattering (SANS). The hydrogels are very sensitive to external stimuli, e.g., presence of a surfactant in swelling solution as demonstrated by their volume change. At the microscopic level, hydrogel structure has to be rearranged to cope with the stimuli-induced volume change.

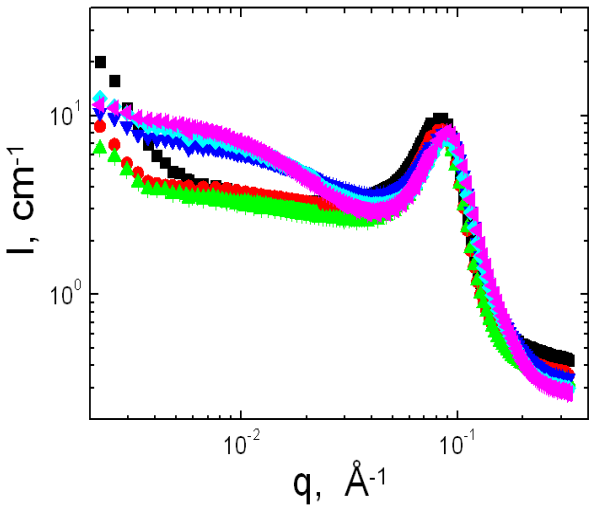

Figure 1. SANS patterns obtained from a stochiometric epoxy network containing POE swollen to equilibrium at 25 °C in: D_2O (■), 0.001M (●), 0.002M (▲), 0.005M (▼), 0.01M (♦), and 0.1M (◀) $C_{14}TAB$ in D_2O.

In this communication, SANS study of changes of epoxy hydrogel structure induced by presence of a cationic surfactant (myristyltrimethylammonium bromide, $C_{14}TAB$) will be reported. Figure 1 shows SANS patterns obtained from a stoichiometric POE- containing epoxy network swollen in D_2O and aqueous surfactant solutions. Changes of the SANS patterns with increasing surfactant concentration are attributed to a progressive thinning of hydrogel nanophase separated structure accompanied by formation of a new structure of much longer characteristic length (hundreds of Å's).