

Aggregation Properties of Amphiphilic Dendrimer in Aqueous Solutions

Hiroki Iwase(1), Aya Ebihara(2) and Tomokazu Yoshimura(2)

(1) ISSP-NSL, Univ. Tokyo, (2) Nara Women 's Univ.

An amphiphilic dendrimer consisting of (amidoamine) (PAMAM) dendrons and a single alkyl-chain was successfully synthesized. By employing surface tension measurements, the amphiphilic dendrimer was shown to have a higher efficiency in lowering the surface tension of water. No information was gathered on the shape and intra-micellar structure such as the size of the dendrimer-head moiety in the aggregates. Therefore, we investigated the meso-scale aggregate behavior of the amphiphilic dendrimer with a hexadecyl chain (C16-2denG2) in aqueous solutions with varying generations (G_n) and pH, respectively.

SANS experiments were performed using the SANS-U spectrometer installed at JRR-3 in Japan Atomic Energy Agency, Tokai, Japan. We employed "High-Intensity" focusing SANS measurements using 55 MgF₂ biconcave compound refractive lenses, which allow us to obtain 3.16 increases in an intensity of the incident neutron compared to a conventional pinhole SANS setup. The neutron wavelength was 7 Å. The sample-to-detector distances were 1 and 8 m. The total covered Q range is 0.005 - 0.35 Å⁻¹. All SANS measurements were performed at room temperature.

Figure 1 shows the pH dependence of SANS profiles for amphiphilic dendrimers with two dendrons (C16-2denG2) in aqueous solutions. In the range of pH from 2 to 7, the broad peak was observed around $Q = 0.05$ Å⁻¹, resulting in repulsive interparticle interactions between the aggregates. With decreasing pH, the SANS intensities for the C16-2denG2 were decreased at $Q = 0.01 - 0.1$ Å⁻¹, and were drastically increased at $Q < 0.01$ Å⁻¹. Except for the upturns, the observed SANS results would be fitted using form factor ($P(Q)$) of a polydisperse core-shell sphere

with approximately 30 Å in diameter combined with Hayter-Penfold MSA screened coulomb interaction structure factor ($S(Q)$). The model analysis is now in progress.

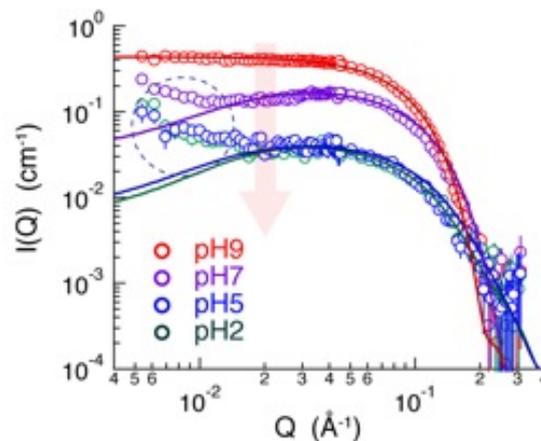


Fig. 1. SANS profile for amphiphilic dendrimers with a hexadecyl chain and two dendrons (C16-2denG2) in aqueous solutions. The solid line lines are fitting results.