

Characterization about the Structure of Emulsion Particles by Using Small Angle X-ray Scattering(SAXS) Method

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Emulsions of multiphase polymeric particles are widely used as adhesive agents, additives and coating agents. The industrial performances of these water-based particles are significantly influenced by their particle morphology and/or chemically grafted polymer chains on the surface.

Characterizations of particle size, size distribution, particle shape and internal core/shell structure by using various analytical instruments are important for the development of emulsion products.

We try to study the adsorption behavior of nonionic surfactants (polyoxyethylenenonylphenylether) and polymers onto the surface of Polystyrene(PS) latex particles from solution by using SAXS method(Ref.1), as similar to the same system of the latex chemically grafted polymer chains on the surface.

At first a series of measurements are carried out by using the SAXS system in the lab-scaled instrument (3 slits system, camera length:25cm, point detector with scintillation counter, Cu K α -target with 200mA \times 50kV, measuring angle:2 θ =0.07 ~2.0deg). It took us over 3 days on the PS-latex measurement, but the data couldn't be given so good as to analyse the adsorption behavior ($q=(4\pi/\lambda) \times$

$\sin(\theta/2)$; λ : wavelength of radiation, θ :scattering angle).

On the other hand, the same samples were measured by using the SAXS system with BL-45XU at SPring-8(camera length :200cm, X-ray imaging intensifier+CCD detector, the wavelength of X-ray : 0.1nm). Astonishingly the same SAXS measurement could be finished within 10 sec. The S/N ratio of the data from SPring-8 system is marvelous comparing with those from our lab-system.

The results are shown in Fig.1. The curves refer to the surfactant concentrations expressed by mg surfactant per g PS-latex particles.

The PS-latex are spherical particles, so many maxima could be observed due to the form factor as sphere particles.

The adsorption of surfactants could be observed on the surface of PS-latex particles. The analysis furthermore showed the formation of free surfactant micelles beyond the point of saturation of the surface of the latex particles. By using SPring-8 system the peak separation process can be carried out more precisely. Now we try to perform the data analysis in more detail.

Ref1: M. Ballauff, J. Bolze, N. Dingenouts, P. Hickl, D. Poetschke, Macromol. Chem. Phys. 197, 3043(1996).

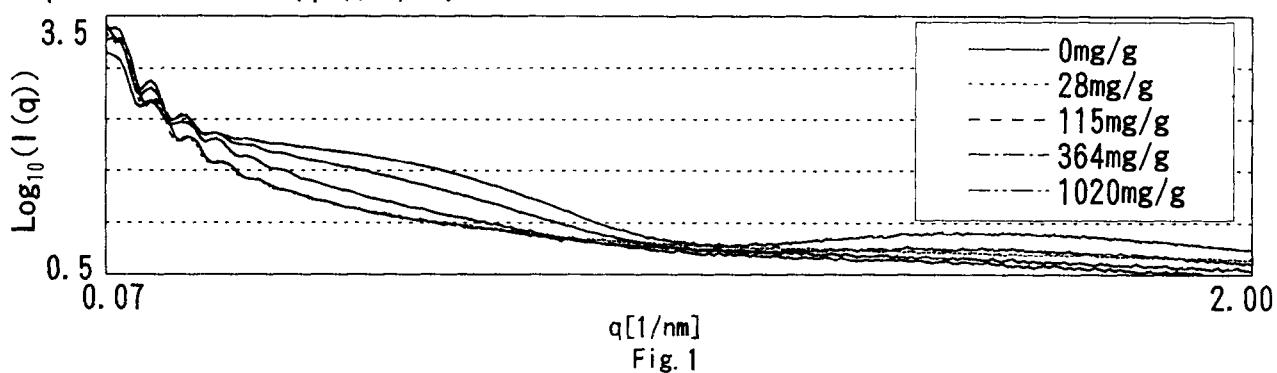


Fig.1