第 263 回化学コロキウムのお知らせ

日時：平成28年9月16日（金） 14:30～16:30
場所：首都大学東京 8号館301室
演者：Michael Gradzielski 教授
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演題：Spontaneously Forming Nanoemulsions – the Special Role of Alkylglycerides and a Comparison to Conventional Nonionic Surfactants

Abstract: Mixtures of nonionic surfactants and polar oils can form metastable nanoemulsions upon simple dilution with water. Their aggregation behaviour in aqueous solution has been studied by means of cmc measurements, light scattering and small angle neutron scattering (SANS) as a function of the alkyl chain length and the number of glyceride units in the head group. Subsequently we studied their phase behaviour upon addition of oils, where it is observed that they do not only form microemulsions that can be swollen substantially by the oil, but also nanoemulsions with droplet sizes of 10-100 nm with long-time stability (several months) can be formed easily by means of the phase inversion concentration (PIC) method, especially with parabens as cosurfactants. The PIC method is particularly interesting as it is a low-energy input method for obtaining nanoemulsions and is based on the change of the preferred interfacial curvature upon dilution with water. The nanoemulsions were studied by means of SANS, SAXS, light scattering and cryo-TEM and showed a bimodal distribution of droplet sizes, one being that of the swollen microemulsion droplets, the other population being substantially bigger. Investigations were done for the different alkyloligoglycerides but also addressing the effect of electrostatic stabilization (by adding small amounts of ionic surfactant), which was found to be very important. These results then are compared to similar systems with alkylethoxylates where a generically similar behaviour is observed, but being quite different with respect to the detailed surfactant properties. Our studies show that the stability depends in a subtle manner on the precise composition of the surfactant/oil mixture and on the extent of dilution. The mechanism of formation and the resulting sizes can be explained in terms of the phase diagram and the sample composition and these results lead to a much improved systematic understanding of the conditions required for forming nanoemulsions by means of the PIC method.

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