

# 公開講演会 最新化学談話シリーズ

平成 28 年度第 5 回談話会

## Spontaneously Forming Nanoemulsions

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主催 九州大学理学部化学教室談話会

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場所：九州大学西新プラザ

Homogeneous mixtures of nonionic surfactants and polar oils form metastable nanoemulsions upon dilution. In particular, alkyloligoglycerides is a very interesting class of nonionic surfactants that show little temperature dependence and a relatively high tendency for forming flat monolayers. Their aggregation behaviour in aqueous solution has been studied by means of cmc measurements, light scattering and SANS as a function of the alkyl chain length and the number of glyceride units in the head group. These experiments showed that the alkyloligoglycerides have a tendency for forming rather flat amphiphilic monolayers. Subsequently we studied their phase behaviour upon addition of oils and found that they do not only form microemulsions that can be swollen substantially by the oil. In addition, nanoemulsions with droplet sizes of 10-100 nm with long-time stability can be formed easily, especially with parabens as cosurfactants, where this process takes place via the phase inversion concentration (PIC) method.

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 being substantially bigger. Investigations were done for the different alkyloligoglycerides but also addressing the effect of electrostatic stabilization by adding small amount of ionic surfactant. These results are compared to similar systems with alkylethoxylates. They showed a generically similar behaviour however, our studies showed that the stability depends in a subtle manner on the precise composition of the surfactant/oil mixture and extent of dilution. The mechanism of formation and the resulting sizes can be explained in terms of the phase diagram and sample composition and these results lead to a much improved systematic understanding of the conditions required for forming nanoemulsions by the PIC method.

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