Interfacial properties of cationic lysine-based surfactants

Toru Tojinbara[1*], Takeshi Endo[1,2], Kenichi Sakai[1,2], Hideki Sakai[1,2]

[1]*Department of Pure and Applied Chemistry, Tokyo University of Science, Noda, Japan*

[2]*Research Institute for Science and Technology, Tokyo University of Science, Noda, Japan*

**7215649@ed.tus.ac.jp*

Cationic surfactants can interact with cellular membranes of microorganisms, and hence have attracted much attention in developing antimicrobial agents. Cationic amphiphiles have also been used in new therapeutic biomedical applications as cationic vesicles to encapsulate RNA or DNA for cellular transfer in gene therapy. Cationic amino acid-based surfactants are a potential candidate in such biomedical applications, because of their relatively environmental and less toxic nature [1, 2].

In this work, we synthesized cationic lysine-based surfactants (*n*-Lys) and studied their interfacial properties. The chemical structure of *n*-Lys (*n* is the hydrocarbon chain length, 10, 12, and 14) is shown in Figure 1. We measured their static surface tension and aqueous phase behavior at 25 ^{o}C. The solution pH was fixed at 2.5, where the two amino headgroups are expected to be fully neutralized by HCl. The aqueous phase behavior was assessed with a combination of visual appearance, optical and polarized microscopy, and small angle X-ray scattering measurements.

We found a decreased critical micelle concentration (cmc) of the surfactants with an increase in the alkyl chain length. We also observed the following phase transition with increasing surfactant concentration; isotropic micellar phase – discontinuous cubic phase – hexagonal liquid crystal phase. The phase transition concentrations shifted to lower values with increasing hydrocarbon chain length. These results are rationalized by the concept of critical packing parameter (CPP); i.e., the longer hydrocarbon analogues exhibit larger CPP and hence tend to form lesser positive curved molecular aggregates.

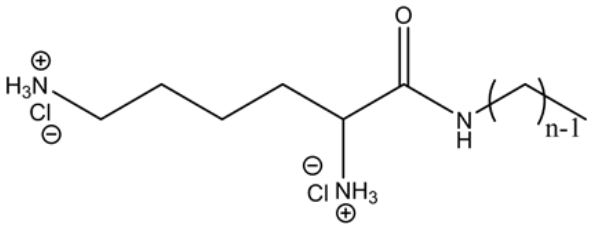

Figure 1 Chemical structure of *n*-Lys (*n* = 10, 12, 14)

[1] A. Colomer *et al*., *J. Med. Chem.*, 2011, **54**, 989.

[2] A. Colomer *et al*., *Langmuir.* 2013, **29**, 7912.