A Clear Lamellar Gel Formation
with a Large Amount of Solubilization of Water

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We have developed a clear lamellar gel by using a nonionic surfactant. Suzuki et al. used lamellar liquid crystals containing a large amount of oil to produce a cleansing gel [1]. However, it was difficult to use under wet condition because it emulsified in the presence of water. The present study aims to retain formation of the clear lamellar gel in the presence of water. Surfactants with multi-chain hydrophobic tails are known to be relatively dominant over the straight chain forms [2, 3]. We selected the branched fatty acid ester Polyoxyethylene (50) hydrogenated castor oil isostearate (PHMIS) for the study. Ethylhexyl palmitate (PE) was used as an oil. Phase diagram of a water/PHMIS/PE system shows a small region where only one phase forms. Therefore, the ratio of PHMIS and PE is fixed, then a part of the water was replaced at Gly, and the change in the one phase region is confirmed. Regardless of the PHMIS/PE ratio it was discovered that the one phase region formed with a Gly proportion of approximately 0.7, Gly concentration was fixed at 70wt% and phase diagram of Gly aq./PHMIS/PE were constructed. From the water/surfactant axis towards the oil vertex, a one phase region formed, dissolving a maximum of 70wt% oil. The phase diagram of 70wt% Gly aq./PHMIS/GM/PE system demonstrates that adding GM expands the liquid crystal region as well as increases oil solubilization, making the one phase region stretch towards the oil vertex (Fig.1). Hence, for a water-PHMIS-oil system, Gly addition increases the soluble region; by using GM as a co-surfactant, liquid crystals can be formed across a wide region. The surfactant to Gly aq. mixture ratio for the LC region, i.e., 1.33:1, was fixed; the vertex for water was taken, and the change in dissolution. This indicates that the clear gel can be solubilization water around 30 wt%. When applied as a make-up remover formulation, this gel solubilized more water than conventional removers, allowing it to be used when the hands and face are wet.