

# **Formation mechanism of surfactant-free emulsion stabilized by cyclodextrins**

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Surfactants are essential to prepare emulsions. However, some kinds of surfactants show adverse effects on the human body or environments. Consequently, many researchers are attempted to prepare emulsion without use surfactants called surfactant-free emulsions. Emulsion stabilized by cyclodextrins has been reported by many researchers in 90s. Although these reports focus on preparation and application for practical use, improving the physical property of the emulsion has many problems due to a lack of the formation mechanism. In this study, the formation mechanism of emulsion using cyclodextrin as emulsifier was investigated by physicochemical and spectroscopic methods. Water in oil type emulsion was prepared in the case of the use of hydrophobic group modified cyclodextrin. From the stability tests and droplet size measurements, the emulsion was destabilized by creaming. The surfaces of droplets were covered with precipitates by cryo-SEM observation. Therefore, this emulsion was classified as Pickering emulsion, which defined as stabilized by adsorption of solids on the surface of the droplets. In the second section,  $\alpha$ -cyclodextrin was used as an emulsifier that forms the inclusion complex with oil molecules. We focused centrifuge precipitates in the oil in water type emulsion. From Raman spectra, centrifuged precipitates and absorbed at the surface of droplets showed similar spectra. From the PXRD, precipitates and original cyclodextrins showed different patterns. Therefore, the precipitate at the surface on the droplets derived from cyclodextrins and related to form the emulsions.