

# The Effect of Sugar Ester for Low Temperature Stability in Milk Fat/Water Emulsion

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Low temperature stability of milk fat/water emulsion system with sugar ester in oil phase have been studied by differential thermal calorimetry (DSC), naked-eye observation, polarized light optical microscopy and oil droplet size distribution measurement. The milk fat/water ratio was 20/80. Tween 20 (1 wt % for all) mixed with water phase and a sugar ester, i.e., P-170 (1wt % for oil phase), mixed with oil phase were employed for emulsifier and additive of oil phase, respectively. They were mixed with a homogenizer for 5 min and passed through microfluidizer for emulsification. The mean diameter of the emulsion was 2.3  $\mu\text{m}$ . The results of the DSC measurement showed that the crystallization temperature of the sample with P-170 increased than that of the pure sample which was without P-170 in oil phase. When the sample was measured at 5 °C by polarized light microscopy, the oil phase of both sample crystallized. However, comparing the sample with P-170 to the pure sample, no aggregation observed in the above (with P-170) emulsion while aggregation occurred in pure sample. Oil droplet size distribution measurement was performed by laser light scattering method at 5 °C. Although all of the oil droplet crystallized in both samples, there was no difference of the size distribution in the system with P-170. On the other hand, rather increase of the size distribution, more than 10  $\mu\text{m}$  for the mean diameter, measured in pure system. As for naked-eye observation, while the oil-water separation was observed during heating from 5 °C to 60 °C in the pure sample, no separation occurred in the sample with P-170. According to the above results, the low temperature stability increased for the milk fat/water emulsion with P-170. These results will be explained by the template effect of P-170, shown in the previous study<sup>1)</sup>, to the crystallization of oil phase; P-170 crystallized, which showed all-trans formation of the acyl-chains in a molecule, on the oil-water interface before crystallization of oil phase, and then oil phase crystallized on the P-170 template.

1) S. Arima, T. Ueji, S. Ueno, A. Ogawa and K. Sato, Coll. Surf. B, 55, 98-106 (2007).