

Stabilization mechanism of water-in-oil emulsions by medium- and long-chain diacylglycerol: post-crystallization vs. pre-crystallization

ABSTRACT

The restriction of using trans-fatty acid is driving the food industries to develop natural, healthy and efficient emulsifiers for the fabrication of water-in-oil (W/O) emulsions. In this work, medium- and long-chain diacylglycerol (MLCD) with high nutritional features and surface activities was used for the preparation of emulsion. The influence of crystallization procedures (pre- or post-crystallization) on the emulsions' stability was examined in terms of the change in droplet size distribution (DSD), sedimentation, microstructure and thermal properties. The sedimentation and coalescence of emulsions were reduced when higher amount (8%, w/w) of MLCD was used. The post-crystallized emulsions showed narrower DSD and less sedimentation compared to the pre-crystallized emulsions. Pre-crystallized emulsion prepared using shear speed of 10,000 rpm showed improved stability due to the reduction of crystal size. MLCD was able to form typical interfacial crystal shells in post-crystallized emulsions whereas only large crystals were formed in the continuous phase in the pre-crystallizations. Therefore, the post-crystallized emulsions had higher thickness and sedimentation was effectively reduced. The findings in this work could be the basis for the future application of MLCD and provide insights on how the physical stabilities of emulsions can be affected when different crystallization processes are employed.

Keyword: Medium and long-chain diacylglycerol; Post-crystallization; Pre-crystallization; Sedimentation; Interfacial crystal shell