

Thermal behavior of concentrated oil-in-water emulsions based on soybean oil and palm kernel olein blends

ABSTRACT

Droplet size distribution and thermal behavior of concentrated oil-in-water emulsions based on soybean oil (SBO)/palm kernel olein (PKO) blends were investigated. The emulsions were prepared using 70% (wt./wt.) oil blends of SBO/PKO as dispersed phases and stabilized by egg yolk. An increase in PKO level (0–40% wt./wt.) in the oil dispersed phase volume fraction caused significant increases ($p < 0.05$) in volume-weighted mean diameter ($d_{4,3}$). The DSC data suggested that crystallization of the emulsions was induced by a ‘template effect’ of yolk constituents via a surface heterogeneous nucleation. Emulsions with 0–20% (wt./wt.) PKO levels in the dispersed phase demonstrated a good cool–heat stability even after three successive thermal cycles (from 50 °C to –70 °C at 10 min/°C). After the first thermal cycle, emulsions with 30% and 40% PKO levels in the oil dispersed phase were destabilized due to strong coalescence and crystallized via volume-surface heterogeneous nucleation. The unstable emulsions were attributable to high level of saturated triacylglycerols from PKO, with high droplet size characteristic, causing them to be more prone to partial coalescence.

Keyword: Soybean oil; Palm kernel olein; Droplet size; DSC; Heterogeneous nucleation; Emulsion stability; Coalescence