ABSTRACT

Liposomes have been used widely as carriers for active ingredients in cosmetic because of their ability to encapsulate both hydrophilic and hydrophobic compounds. In this work, fatty acid liposomes were prepared and introduced into olive oil-in-water emulsions stabilized by C_{14}–C_{18} sucrose ester mixtures at pH 8.5. Light microscopy images of the emulsions showed evidence of the coexistence of oleic acid liposomes and the emulsion droplets. As alkyl chain length of sucrose ester increased, the average droplet size decreased, while the zeta potential became more negative. Further decrease of droplet size was observed when borate buffer was added to the aqueous phase. The free fatty acids in sucrose esters and olive oil are neutralized in borate buffer; consequently, fatty acid salts were produced and served as co-surfactants. The synergistic stabilization of emulsions by the mixture of sucrose esters and fatty acid salt resulted in higher stability, smaller droplet size, and lower polydispersity. The drastic increase in negative zeta potential was possibly due to the presence of free fatty acid salts in the emulsion systems. The flow curves at steady rate displayed five distinctive regions. The polydispersity of droplets enhanced the shear thickening effect at low shear rates and shear-banding effect at middle shear rates. Formation of fatty acid salts as co-surfactants caused the viscosities of the emulsions to increase by an order of magnitude. Similar changes can be seen in the G’ and G’’. The great enhancement of the G’ indicates the emulsion was too stiff and rigid. The presence of oleic acid liposome significantly reduced the viscosities and viscoelasticity of the emulsion by half an order of magnitude; this decreased viscosity and viscoelasticity helped enhance better spreadability.

ABSTRAK

Liposome banyak digunakan sebagai pengangkut untuk bahan-bahan aktif dalam cosmetic disebabkan oleh keupayaan untuk mengangkut kompaun-kompaun hidrofilik dan lipofilik. Dalam kajian ini, liposome asid lemak telah disediakan dan dimasukkan ke dalam jenis-jenis minyak-dalam-air emulsi yang distabilkan oleh campuran C_{14}–C_{18} ester sukrosa pada pH 8.5. Gambar-gambar mikroskop cahaya menunjukkan bukti kehadiran liposome asid lemak bersama dengan titisan emulsi. Dengan kapanjangan rantai alkyl ester sukrosa meningkat, purata saiz titisan menurun di samping potensi zeta menjadi lebih negatif. Penurunan saiz titisan yang lanjut dapat diperhatikan apabila penampan mengandungi borat ditambahkan ke dalam fasa akueus. Asid lemak bebas dalam ester sukrosa dan minyak zaitun telah dineutralkan dalam penampan. Akibatnya, garam-garam asid lemak telah dihasilkan dan bertindak sebagai co-surfactannts. Kestabilan synergi terhadap emulsi oleh campuran ester sukrosa dan garam asid lemak mengakibatkan kestabilan yang lebih tinggi, saiz titisan yang lebih kecil dan kepolisebaran yang lebih rendah. Peningkatan yang mendadak dalam nilai negatif potensi zeta mungkin disebabkan oleh kehadiran garam-garam asid lemak bebas dalam emulsi sistem. Lengkungan aliran pada kadar stabil memaparkan lima rantau tersendiri. Kepolisebaran titisan meningkatkan kesan ricihan penebalan pada kadar ricihan rendah dan kesan ricihan banding pada kadar ricihan tengah. Pembentukan garam-garam asid lemak sebagai co-surfactants menyebabkan kelikatan emulsi meningkat sebanyak satu peringkat magnitud. Perubahan yang serupa boleh dilihat pada G’ dan G’’. Peningkatan besar pada G’ menunjukkan emulsi adalah sangat kaku and tegar. Kehadiran liposome asid lemak telah menurunkan kelikatan dan kelikatkenyalan emulsi sebanyak separuh peringkat magnitude; penurunan kelikatan dan kelikatkenyalan ini membantu menambah keupayaan sapuan yang lebih baik.