EMULSIFICATION AND DISPERSANT PROPERTIES OF SUGAR ESTER GLYCOLIPID IN WATER IN OIL AND OIL IN WATER EMULSION

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ABSTRACT

The influence of different dispersing agent on the rheological behaviors of paraffin oil-water emulsion with addition of TiO_2 for uv-protect and moisturizing active ingredient was studied. While making creams with minimal structural defects and longer storage stability, it is important that preparation conditions be optimized. Settle volume properties, Zeta potential, effective diameter and settle volume of TiO_2 suspension were studied in the presence of glycolipid (DDM and Carrageenan), nonionic (PEG 10,000 and Brij 35P) as well as anionic surfactants (sodium dodecyl sulfate, SDS). In the experiments, the higher concentration of dispersing agents shows higher settle volume percentage, higher zeta potential and gives a smaller average size of particles distribution in the TiO_2 solution. The results obtained show significant influence of the type of surfactants on the measured quantities. Among the dispersing agents studied, λ-Carragenan was proven to be most effective dispersing agent followed by DDM, SDS, PEG 10,000, and Brij 35P. It could be due to the existence of anionic sulfate groups, λ-Carrageenan can interact strongly with oppositely charged cationic by ionic interaction. The systems investigated also reports structure and viscoelastic property of dispersing agents stabilized o/w emulsions, and they tend to show higher shear viscosity (η) at whatever given shear rate ($\dot{\gamma}$) during steady rotational shear measurement and appeared superior of storage modulus (G') and loss modulus (G'') value throughout all measured in oscillatory shear test, in contrast to by DDM, SDS, PEG 10,000, and Brij 35P stabilized emulsion. These λ-Carragenan stabilized emulsions also exhibited a higher degree of shear thinning behavior and results in a higher magnitude of yield stress (σ_y),which means better stabilized and have a good storage stability compared to DDM, SDS, PEG 10,000, and Brij 35P stabilized o/w emulsions.

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Abbreviations

γ	Free energy of sample in liquid-vapor
$\Delta\ G_{formation}$	Free energy of formation of droplets from a bulk liquid
$\Delta A\gamma_{12}$	Interfacial tension between the two liquids
$T\ \Delta S_{configuration}$	Entropy configuration
ΔP	Laplace pressure difference between two droplets
θ	Shear strain
F	Force generated to surface
A	Area of the surface
δu	Deformation of material
h	Distance of upper and lower level part
G	Shear modulus / rigidity modulus
η	Shear viscosity
σ	Shear stress
γ	Shear strain / deformation
$\dot{\gamma}$	Shear strain rate
σ_y	Yield stress
η_o	Zero shear viscosity
σ_E	Shear stress for elasticity
γ_E	Shear strain for elasticity
σ_V	Shear stress for viscosity
$\dot{\gamma}_V$	Applied shear rate for viscosity
ω	Angular velocity / frequency
γ_0	Maximum strain / amplitude
G^*	Complex modulus
G'	Storage modulus / elasticity
G''	Loss modulus / viscosity
δ	Phase angle

σ_s	Surface tension
P_w	Wilhelmy-force
l_w	Wetted length
Θ	Contact angle between the tangents at the wetting line
θ	Deflection angular
ΔG_{mic}^0	Free energies of micellization
η_R	Relative viscosity
η_{low}	Low shear viscosity
n	Power law index
ϖ	Frequency
G_o	Plateau modulus
γ_{cr}	Critical strain
E_c	Cohesive energy
Π	Interfacial pressure
Γ_∞	Saturation adsorption density
A_{min}	Minimum surface area per surfactant molecule

GLOSSARY

DDM	Dodecyl-β-D-maltoside
o/w	Oil in water emulsion
w/o	Water in oil emulsion
E	Weight percentage of ethylene oxide in molecule
SDS	Sodium dodecyl sulphate
CMC	Critical micelle concentration
PEG 10,000	Polyethylene Glycol 10,000
Brij 35P	Polyethylene dodecyl ether
M	Molarity

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