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

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BY
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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, $\lambda$-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, $\lambda$-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 ($\eta$) 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 $\lambda$-Carragenan stabilized emulsions also exhibited a higher degree of shear thinning behavior and results in a higher magnitude of yield stress ($\sigma_y$),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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All gratifications are referred to Allah.

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\( \gamma \)  Free energy of sample in liquid-vapor
\( \Delta G_{\text{formation}} \)  Free energy of formation of droplets from a bulk liquid
\( \Delta A \gamma_{12} \)  Interfacial tension between the two liquids
\( T \Delta S_{\text{configuration}} \)  Entropy configuration
\( \Delta P \)  Laplace pressure difference between two droplets
\( \theta \)  Shear strain
\( F \)  Force generated to surface
\( A \)  Area of the surface
\( \delta u \)  Deformation of material
\( h \)  Distance of upper and lower level part
\( G \)  Shear modulus / rigidity modulus
\( \eta \)  Shear viscosity
\( \sigma \)  Shear stress
\( \gamma \)  Shear strain / deformation
\( \dot{\gamma} \)  Shear strain rate
\( \sigma_y \)  Yield stress
\( \eta_0 \)  Zero shear viscosity
\( \sigma_E \)  Shear stress for elasticity
\( \gamma_E \)  Shear strain for elasticity
\( \sigma_v \)  Shear stress for viscosity
\( \gamma_v \)  Applied shear rate for viscosity
\( \omega \)  Angular velocity / frequency
\( \gamma_0 \)  Maximum strain / amplitude
\( G^* \)  Complex modulus
\( G' \)  Storage modulus / elasticity
\( G'' \)  Loss modulus / viscosity
\( \delta \)  Phase angle
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<tr>
<td>$\sigma_s$</td>
<td>Surface tension</td>
</tr>
<tr>
<td>$P_w$</td>
<td>Wilhelmy-force</td>
</tr>
<tr>
<td>$l_w$</td>
<td>Wetted length</td>
</tr>
<tr>
<td>$\Theta$</td>
<td>Contact angle between the tangents at the wetting line</td>
</tr>
<tr>
<td>$\theta$</td>
<td>Deflection angular</td>
</tr>
<tr>
<td>$\Delta G_{mic}^0$</td>
<td>Free energies of micellization</td>
</tr>
<tr>
<td>$\eta_r$</td>
<td>Relative viscosity</td>
</tr>
<tr>
<td>$\eta_{low}$</td>
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<td>$n$</td>
<td>Power law index</td>
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<td>$\omega$</td>
<td>Frequency</td>
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<tr>
<td>$G_p$</td>
<td>Plateau modulus</td>
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<tr>
<td>$\gamma_{cr}$</td>
<td>Critical strain</td>
</tr>
<tr>
<td>$E_c$</td>
<td>Cohesive energy</td>
</tr>
<tr>
<td>$\Pi$</td>
<td>Interfacial pressure</td>
</tr>
<tr>
<td>$\Gamma_{ss}$</td>
<td>Saturation adsorption density</td>
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<tr>
<td>$A_{min}$</td>
<td>Minimum surface area per surfactant molecule</td>
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# GLOSSARY

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