

Effects of Food Surfactants on the Phase Inversion Temperature on a well defined C₁₀E₄/Octane/Water system

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The Phase Inversion Temperature (PIT), is a concept introduced by Shinoda et al. in the 1960's [1] that corresponds to the temperature at which the hydrophilic/lipophilic character of nonionic surfactants, in particular polyethoxylated alcohols (CiEj's), changes by dehydration of the polyoxyethylene units, inducing a phase inversion from O/W to W/O emulsion on heating. Although PIT is limited to nonionic surfactants and to the temperature range in which water is liquid, it takes into account all formulation parameters and it is based on a precisely defined experimental methodology. The PIT value is attained close to the T* temperature, i.e. when the affinity of the surfactant for oil and water are the same.

Most industrial emulsions generally depart from classical surfactant/oil/water (SOW) ternary systems and the introduction of mixtures of surfactants is often required. The influence of 15 non-ionic commercial surfactants commonly used in food and cosmetic industries (sucrose esters, monoglycerides, lecithins, Tweens and Spans), on the phase behavior of the ternary 3% C₁₀E₄/octane/water system has been investigated in order to establish a relationship between the chemical structure and the effect on the emulsion. The PIT variation of the model system was measured upon addition of food surfactant in the concentration range 0.12-1.5%. The hydrophilic/lipophilic balance of the food surfactants could be evaluated by comparing the values of dPIT/dC (°C/%w).

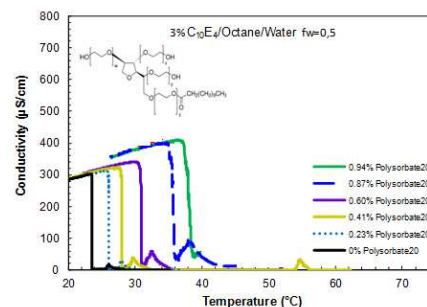


Fig. 1. Effect on Tween 20 on the conductivity of the C₁₀E₄/Octane/Water system

Reference :

[1] The correlation between phase inversion temperature in emulsion and cloud point in solution of nonionic emulsifier K. Shinoda, H. Arai, *J. Phys. Chem.*, **(1964)**, 68, 3485.