Determining antioxidant distributions between the oil, water, and interfacial regions of model food emulsions: A pseudophase kinetic model approach

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Antioxidant, AO, distribution in food emulsions depends on a number of variables including the temperature, acidity, the hydrophobicity and the nature of the oil, emulsifier and AO. Most methods for determining AOs distributions are based on separation and analysis of components in each phase, e.g., by centrifugation or ultrafiltration followed by HPLC analysis of AO concentrations, from where the partition constants are estimated, but they cannot provide estimates of interfacial AO concentrations and hence provide a limited knowledge on antioxidant distributions.

Here we present a new approach focused on determining the partition constants of the AO between the oil-interfacial, $P_{O}^{I}$, and water-interfacial, $P_{W}^{I}$, regions in the emulsion itself rather than in determining analyte concentrations. The approach is based on the reaction of a 4-hexadecylbenzenediazonium, 16-ArN₂⁺, ions with antioxidants, and requires no physical separation of the phases in emulsions. We will show some results on the effects of emulsifier concentration, acidity, the hydrocarbon chain length and oil nature on the distribution of a number of gallic acid derivatives. The results may be of interest for interpreting the effect of antioxidant and oil distributions on antioxidant efficiencies.