

Determining Antioxidant Distributions between the Oil, Water, and Interfacial Regions of Model Food Emulsions

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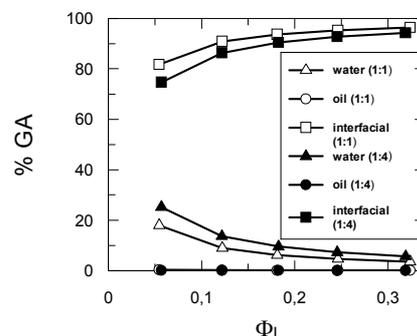
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Establishing reliable criteria for selecting the most efficient antioxidant, AO, for a particular application is a major unsolved problem in food emulsions and one of general importance in nutrition and health because multiple factors that affect activities of AOs including their locations within emulsified food. Most methods for determining AOs distributions are based on separation and analysis of each phase, e.g., by centrifugation or ultrafiltration followed by HPLC analysis of AO concentrations in each phase and cannot provide estimates of interfacial AO concentrations. The absence of a practical procedure to determine AO distributions prevents the development of criteria for comparing the efficiencies of antioxidants and for selecting the best antioxidant for a particular application.

We have developed a new approach that requires no physical separation of the phases in emulsions for determining the distributions of antioxidants and oils in emulsions. The distributions of antioxidants are described by two partition constants, P_O^I and P_W^I which can be determined by employing the well established pseudophase mode to interpret the variation of k_{obs} with emulsifier concentration for a reaction between the AO and a chemical probe whose reactive functionality is located in the interfacial region of the system. These

results may provide fundamental information for interpreting the effect of antioxidant and oil distributions on antioxidant efficiencies.



Representative distribution of Gallic Acid in 1:1 and 1:4 (v:v) corn oil/water/ $C_{12}E_6$ emulsions as a function of the emulsifier volume fraction at $T = 25^\circ C$.