All-aqueous Emulsions – Formation, Characterization and Stability

(Talk #29)

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All-aqueous emulsions are aqueous droplets suspended in an immiscible aqueous phases. The immiscibility of the two aqueous phases is imparted by the addition of two incompatible additives, such as polysaccharides, polymers, salts and biomolecules to water: At sufficiently high concentration of the additives, the resultant solution separate into two immiscible phases. In comparison to oil-water-based emulsion, all-aqueous emulsions exhibit many different characteristics [1]. First of all, due to the relative similarity in the nature of the two immiscible phases, interfaces of all-aqueous emulsions tend to show significantly lower interfacial tension. Secondly, small molecules such as water can easily diffuse across the all-aqueous interfaces. Thirdly, as a result of the typically high additive concentrations, the emulsion phases are often highly viscous. Fourthly, by limiting the type of additives to cytocompatible ones, such as bio-molecules, sugars, polysaccharides, and biocompatible polymers, the final emulsions can be made completely bio- and cyto-compatible. These differences from typical oil-water-based emulsions lead to differences in jet breakup dynamics [2], sensitivity of the interfaces towards fluidic fluctuations [3], permeability across emulsion interfaces [4], responses to electric field [5] and material fabrication through emulsion-templating. In the talk, I will highlight how these differences can be harnessed to achieve novel applications of emulsions. I will end the talk by discussing some challenges in both the fundamental understanding and technological application of all-aqueous emulsions [1].

References:

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