Pickering emulsions stabilized by stimuli-responsive microgels: study of their stability

Auteur : Duggal, Hitesh
Promoteur(s) : Pfennig, Andreas
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By: Hitesh Duggal

Supervisors:

Dr. Véronique Schmitt: Researcher, Centre de Recherche Paul Pascal, CNRS, France

Dr. Valérie Ravaine: Professor, INP Bordeaux, France,

Dr.-Ing. Andreas Pfennig: Professor, Department of Chemical Engineering, University of Liège, Belgium

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Summary

Two incompatible liquids compose the dispersion system known as an emulsion. Microgels can act as stabilizers in emulsions, a phenomenon known as Pickering emulsions. Microgels are colloidal particles that can deform and adsorb at liquid interfaces, which explains why microgel-stabilized emulsions have distinctive properties due to their soft and deformable surfaces. The goal of this research is to discover the link between emulsion interfacial characteristics and mechanical behavior. Pickering emulsions were successfully prepared by stabilizing oil-in-water emulsions using pNIPAM microgels in this research. Microgels and emulsions with a narrow size distribution have been synthesized and prepared by carefully operating various parameters. Microgels of varied sizes and cross-linking rates were able to be studied in emulsions with minimal polydispersity, and optical microscopy was used to analyze the packing of microgels at the interface. The first section of the result addressed the formation of emulsions by means of rotor stator homogenization that is driven by limited coalescence phenomenon. Then, the compression behavior of the emulsions was determined by measuring the relationship between osmotic pressure and droplet's volume fraction with the help of centrifugation. This was achieved by analyzing different parameters like the effect of microgel cross-linking density and size, the nature of the oil phase, and formulation technique (emulsification procedure) on the flocculation state. Then, the results were interpreted in terms of the elasticity of the adsorbent particles due to the presence of intrinsically attractive contacts, which proved that the interface of microgels-stabilized drops exhibits the linear relationship between stress and strain that is typical of elastic behavior. With these findings, small size microgels of the 2.5% BIS type appear to be the most suitable for obtaining non-flocculated and kinetically stable emulsions with the highest osmotic pressure and droplets volume fraction as well as linear behavior in interpretation which confirms the elastic behavior of the emulsion.