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# Simple, Reversible Emulsion System Switched by pH on the Basis of Chitosan without Any Hydrophobic Modification

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## Abstract

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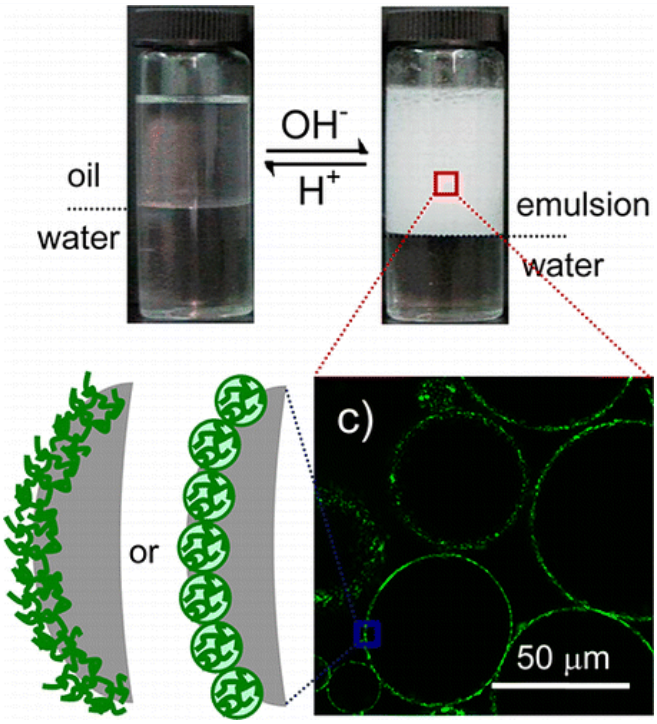


Chitosan without hydrophobic modification is not a good emulsifier itself. However, it has a pH-tunable sol–gel transition due to free amino groups along its backbone. In the present work, a simple reversible Pickering emulsion system based on the pH-tunable sol–gel transition of chitosan was developed. At pH > 6.0, as adjusted by NaOH, chitosan was insoluble in water. Chitosan nanoparticles or micrometer-sized floccular precipitates were formed in situ. These chitosan aggregates could adsorb at the interface of oil and water to stabilize the o/w emulsions, so-called Pickering emulsions. At pH < 6.0, as adjusted by HCl, chitosan was soluble in water. Demulsification happened. Four organic solvents (liquid paraffin, *n*-hexane, toluene, and dichloromethane) were chosen as the oil phase. Reversible emulsions were formed for all four oils. Chitosan-based Pickering emulsions could undergo five cycles of emulsification–demulsification with only a slight increase in the emulsion droplet size. They also had good long-term stability for more than 2 months. Herein, we give an example of chitosan without any hydrophobic modification to act as an effective emulsifier for various oil–water systems. From the results, we have determined that natural polymers with a stimulus-responsive sol–gel transition should be a good particulate emulsifier. The method for in situ formation of pH-responsive Pickering emulsions based on chitosan will open up a new route to the preparation of a wide range of reversible emulsions.

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