

Chitosan Stabilized Oil-in-Water Pickering Emulsion Optimized for Food-Grade Application

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Abstract : Pickering emulsions (PE) were developed in response to increased demand for organic, eco-friendly, and biocompatible products. These emulsions are usually stabilized by solid particles. In this research, we created chitosan-based sunflower oil-in-water (O/W) PE without the need for a surfactant. In our work, we employed chitosan, a biopolymer derived from chitin, as a stabilizer. This decision was influenced by chitosan's biocompatibility and biodegradability, as well as its anti-inflammatory and antibacterial capabilities. It also has other functional properties, such as antioxidant activity, a probiotic delivery mechanism, and the ability to encapsulate bioactive compounds. The purpose of this study was to govern key parameters that can be changed to obtain stable PE, such as the concentration of chitosan (0.3-0.5 wt.%), the concentration of oil (0.8-1 vol%), the pH of the emulsion (3-7) manipulated by the addition of 1M HCl/ 4M NaOH, and the amount of electrolyte (NaCl-0-300mM) added to increase or decrease ionic strength. A careful combination of these properties resulted in the production of the most stable and optimal PE. Particle size study found that emulsions with pH 6, 0.4% chitosan, and 300 mM salts were exceptionally stable, with droplet size 886 nm, PI of 0.1702, and zeta potential of 32.753.83 mV. It is fair to infer that when ionic strength rises, particle size, zeta potential, and PI value decrease. A lower PI value suggests that emulsion nanoparticles are more homogeneous. The addition of sodium chloride increases the ionic strength of the emulsion, facilitating the formation of more compact and ordered particle layers. These findings provide light on the creation of stimulus-responsive chitosan-based PE capable of encapsulating bioactive materials, functioning as antioxidants, and serving as food-grade emulsifiers.

Keywords : pickering emulsion, biocompatibility, eco-friendly, chitosan

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