

## Chitin Nanocrystals as Sustainable Surfactant Alternative for Enhancing Oil-in-Water Emulsions Stability in Oil and Gas Fields

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**Abstract :** This study explored the application of chitin nanocrystals (ChiNCs), derived from a renewable and environmentally friendly material, as stabilizers for oil-in-water (O/W) emulsions. O/W emulsions are commonly used in various applications but are prone to instability and degradation over time. Instability can occur due to factors such as flocculation, coalescence, and gravitational separation, including creaming and sedimentation, either independently or simultaneously. To produce ChiNCs, chitin powder underwent acid hydrolysis. Transmission electron microscopy (TEM) analysis revealed that ChiNCs exhibited a needle-like morphology, with lengths ranging from 200 to 800 nm and widths ranging from 20 to 80 nm. The surface charge of ChiNCs was negative at pH values above 7 and positive at pH values below 7. The rheological properties of O/W emulsions stabilized by ChiNCs were compared to those stabilized by synthetic surfactants, namely Tween 80 and CTAB. The emulsions stabilized by ChiNCs demonstrated higher yield stress and lower shear viscosity compared to those stabilized by synthetic surfactants. This indicates that ChiNC-stabilized emulsions are more stable and less prone to breakdown. Based on these findings, ChiNCs show promise as an alternative to synthetic surfactants for stabilizing O/W emulsions.

**Keywords :** chitin nanocrystals, colloidal pickering, emulsion rheology, oil-in-water, synthetic surfactant

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