O-Carboximethyl Chitosan Nanogels as Emulsion Stabilizers

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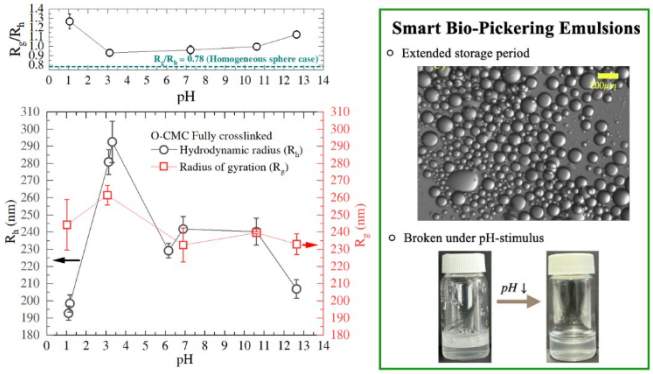
We present a physicochemical characterization using a wide range of scattering techniques (DLS, SLS, and SAXS) of O-carboximethyl chitosan (O-CMC) nanogels crosslinked with formaldehyde and isopropyl isocyanide via a Ugi reaction, considering three distinct crosslinking densities: low, intermediated and fully crosslinked. The scattering techniques reveal a non-isotropic structure, in which, near the pI, the nanogels aggregate, increasing the hydrodynamic radius. The polymer density is proportional to the crosslinking density, yielding a soft structure for the partially crosslinked nanogels, consistent with AFM measurements of the dry surface. The O-CMC nanogels and the linear polymer were tested as emulsifiers; all structures formed stable emulsions and broke under pH stimuli. Here, the O-CMC nanogel partially achieved a more stable and monodisperse emulsion, following the same trend in the softness dependence of synthetic polymer nanogels. We introduce a new candidate for creating biodegradable, smart Pickering emulsions and demonstrate how scattering techniques from soft matter physics can enhance the understanding of innovative food systems.

Keywords:
Chitosan nanogels, scattering characterization, green Pickering emulsion



Hydrodynamic radius and radius of gyration for O-CMC nanogels as a function of pH, with a ratio Rg/Rh > 0.78, demonstrate a non-spherical expanded structure and their application as emulsion stabilizers.