Engineering of interfaces in food emulsions by Pickering particles: physical and oxidative stability

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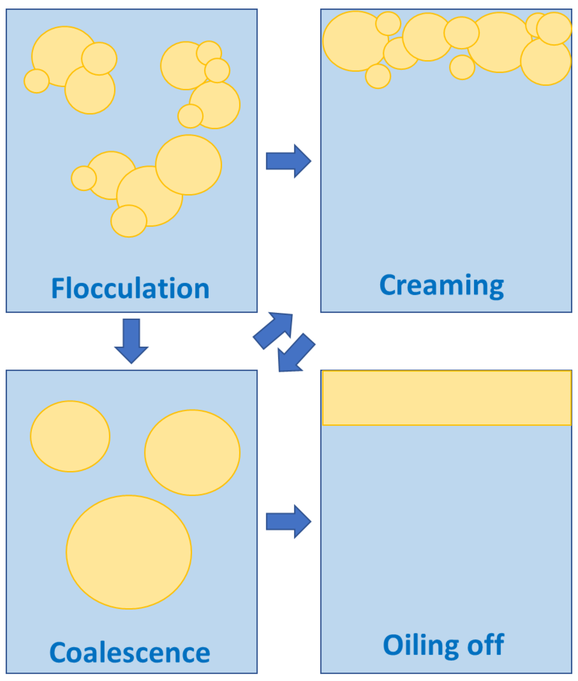
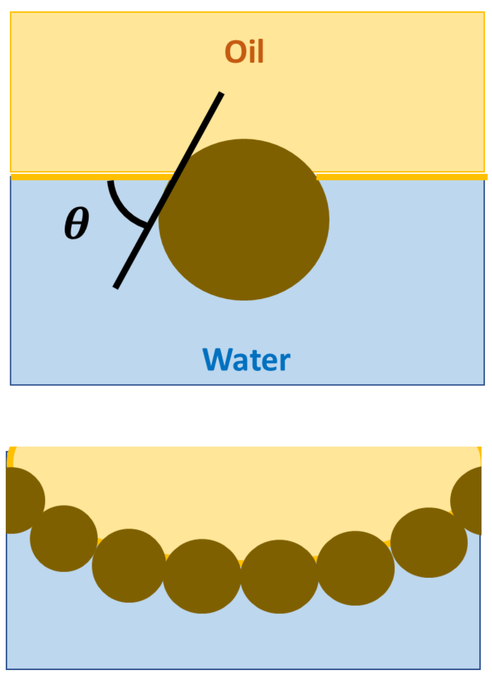
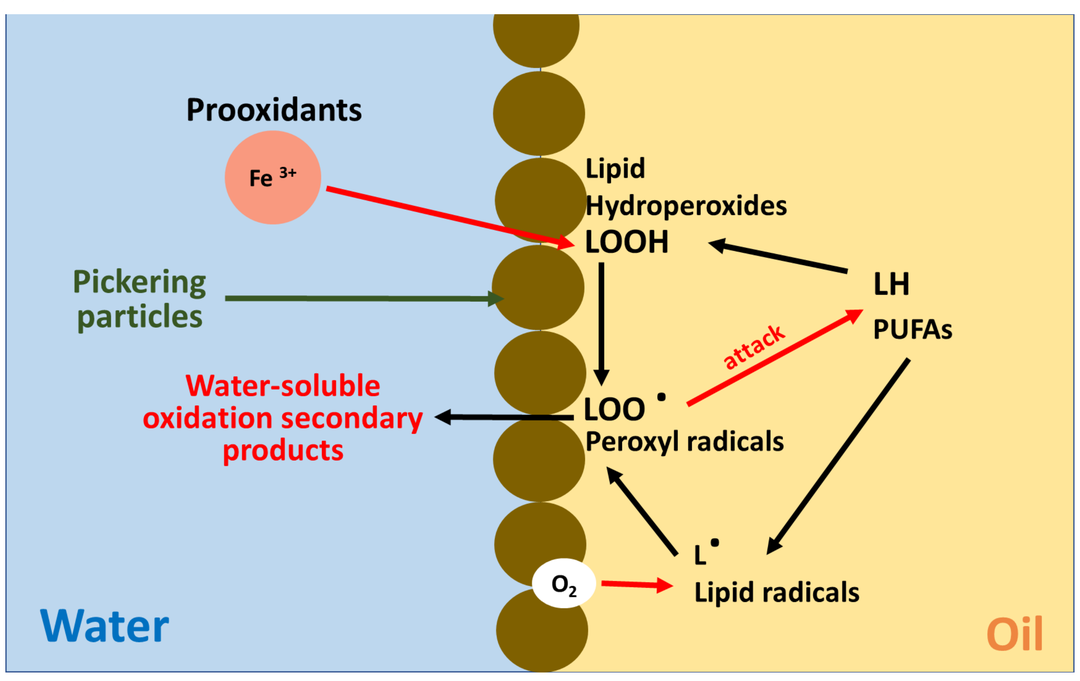
Background and Objective

- **Oil-in-water (o/w) food emulsions** may be **physically destabilized** causing flocculation, creaming, coalescence, and oiling off. Conventional emulsifiers, such as protein and surfactants, stabilize the oil/water interface due to their ability to decrease interfacial tension. Such emulsifiers cause 1) instability due to mobility at the interface; 2) consumer unacceptance (clean-label policy).
- **Pickering particles** can be irreversibly attached to the interface and offer high physical emulsion stability.
- Consumers demand healthier diets, requiring oil rich in **polyunsaturated fatty acids (PUFAs)** incorporated into food emulsions. However, this makes the product more susceptible to **chemical destabilization (lipid oxidation)** which leads to off-flavors.
- This project **aims** at understanding the underlying mechanism of physical and oxidative stability in food Pickering emulsions.
- Based on this, guidelines for the design of food Pickering emulsion may be derived.

Physical Destabilization ⟵ Pickering Stabilization ⟶ Oxidative Destabilization







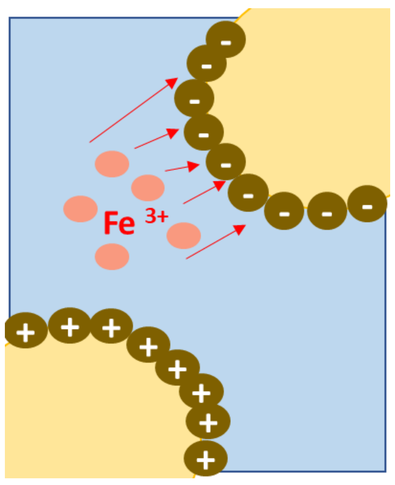
Approach

Silica nanoparticles used as Pickering particles

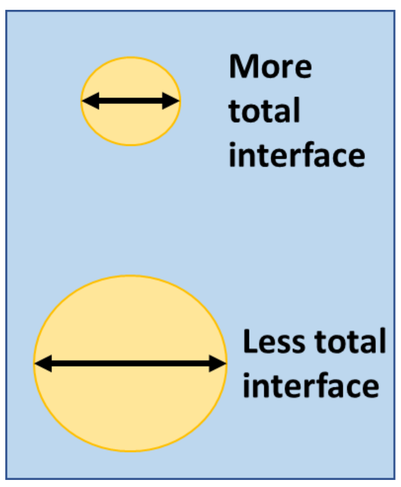
- Well-defined particle size
- Well-defined hydrophobicity (wettability)
- Ideal model system for food
- Systematic variation of particle charge and droplet size
- Suitable for lipid oxidation measurement?

Research Question

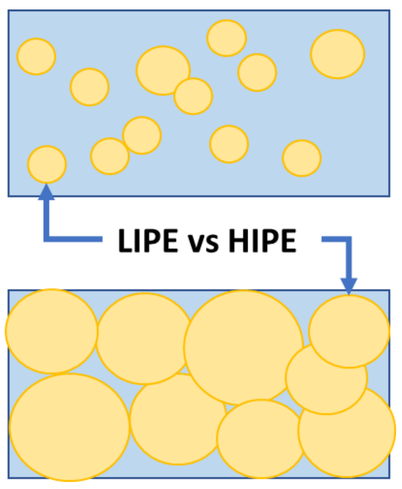
1. Effect of particle charge



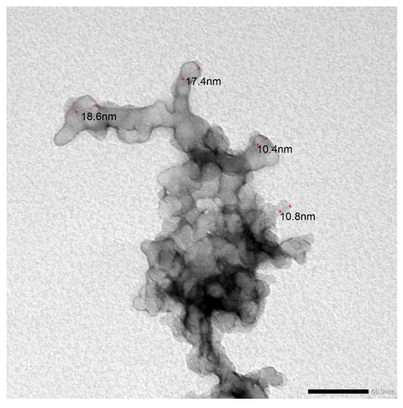
2. Effect of droplet size



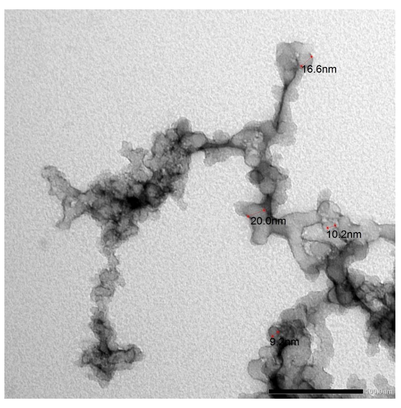
3. Effect of oil fraction



First images of particles and emulsions



Hydrophilic fumed silica nanoparticle (TEM)



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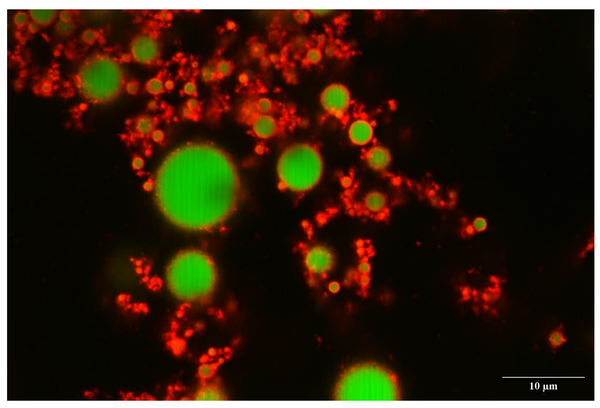

Emulsions stabilized by silica nanoparticles (CLSM)

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PICKFOOD

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