Optimizing Pickering Emulsions with Surface-Modified Halloysite Nanotubes

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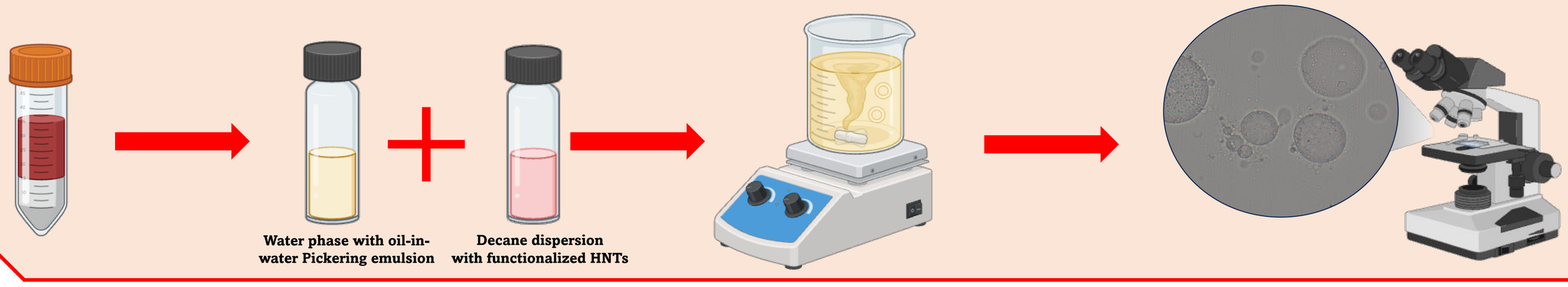
Abstract

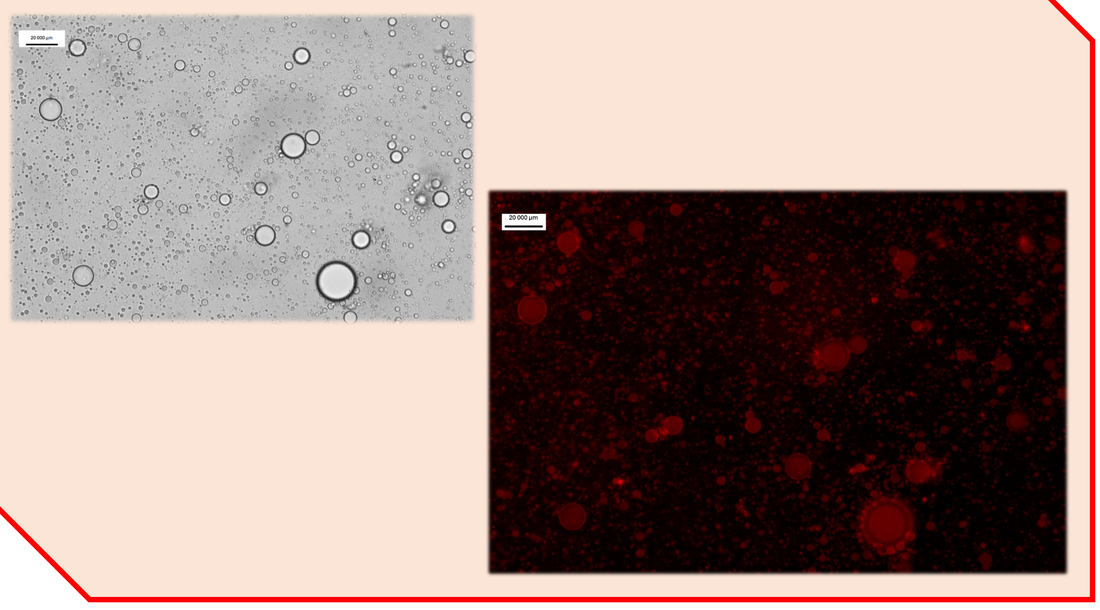
Halloysite Nanotubes (HNTs) are natural aluminosilicates with a hollow nanotubular structure, appreciated for their high aspect ratio, surface tunability, and eco-compatibility. This work investigates their role in stabilizing Pickering emulsions, using different surface modifications such as aminosilanes and hexadecyltrimethylammonium bromide. The latter provided the most effective emulsion stabilization. Current studies are focused on developing stable triphasic emulsions (o/w/o and w/o/w) for potential applications in wastewater treatment, pharmaceuticals, and food science.[1]

Experimental Procedure

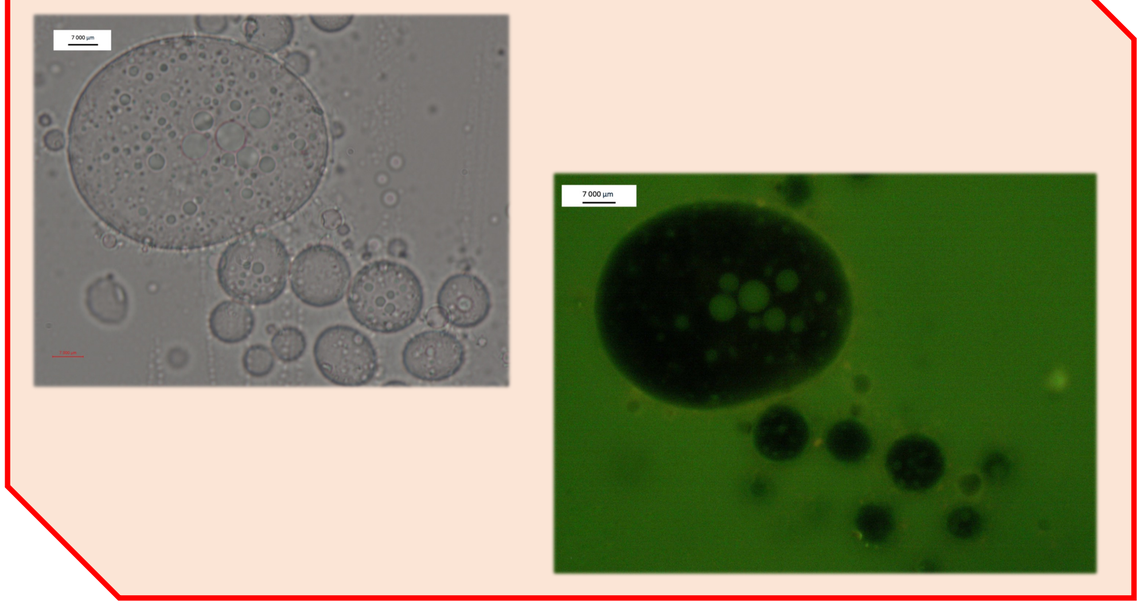
A stable oil-in-water Pickering emulsion was first prepared by adding 0.5 wt% pristine halloysite nanotubes to a 50:50 decane–water system. After extracting the oil phase, an equivalent amount of hexadecyltrimethylammonium bromide (C16Br) functionalized HNTs dispersion in decane was added to design double Pickering emulsions.



Oil in Water System



o/w/o System



Future Perspectives

The final system exhibits stable and consistent behavior upon the development of the triphasic Pickering system from the former biphasic o/w. Over time, the oil-water-oil configuration remains stable. As next steps, the same procedure will be carried out to develop the inverse system and to design new triple Pickering emulsions.

Acknowledgments

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[1] Thompson, K. L.; Mable, C. J.; Lane, J. A.; Derry, M. J.; Fielding, L. A.; Armes, S. P. Preparation of Pickering Double Emulsions Using Block Copolymer Worms, Langmuir 2015, 31*(14)*, 4137–4144.