

Dynamic Complex Emulsions as Functional Particle Templates

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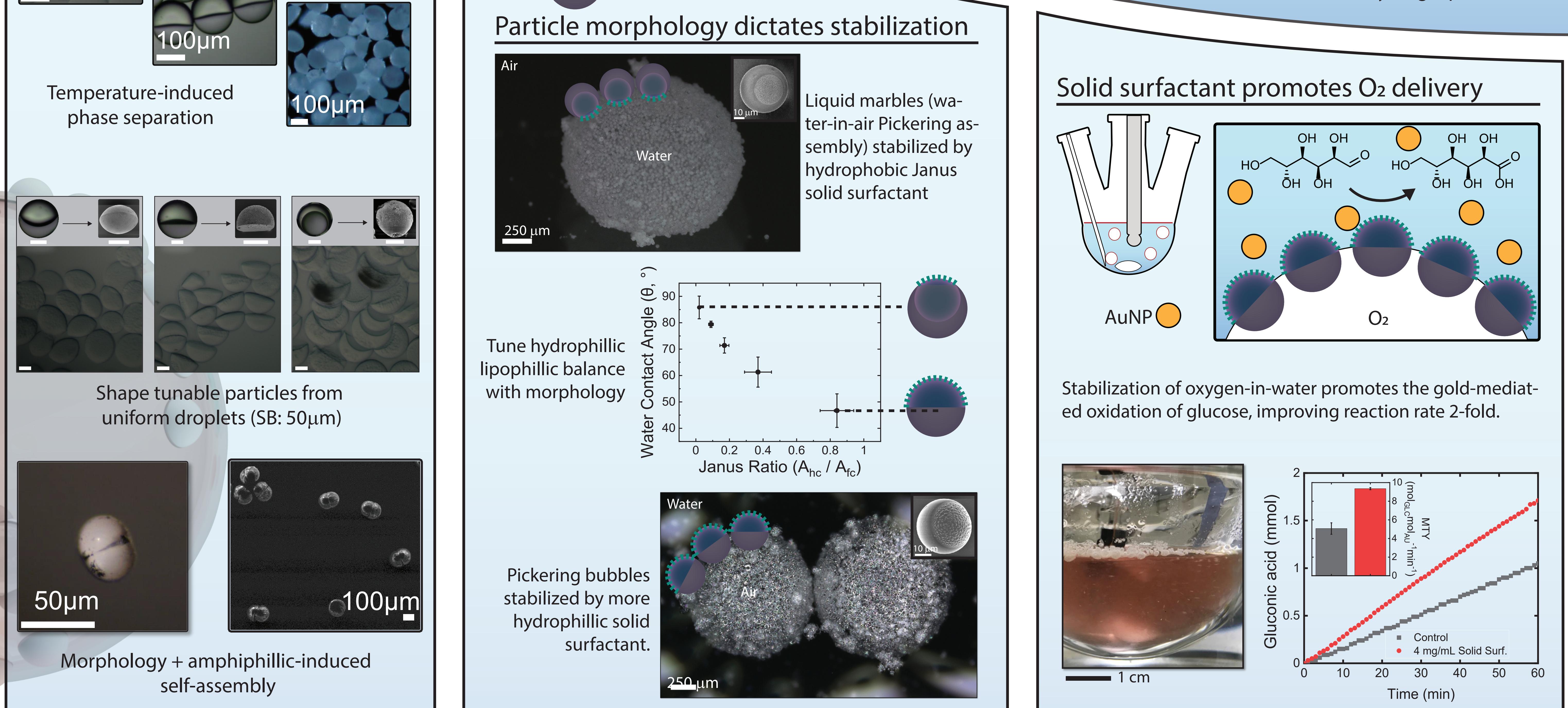
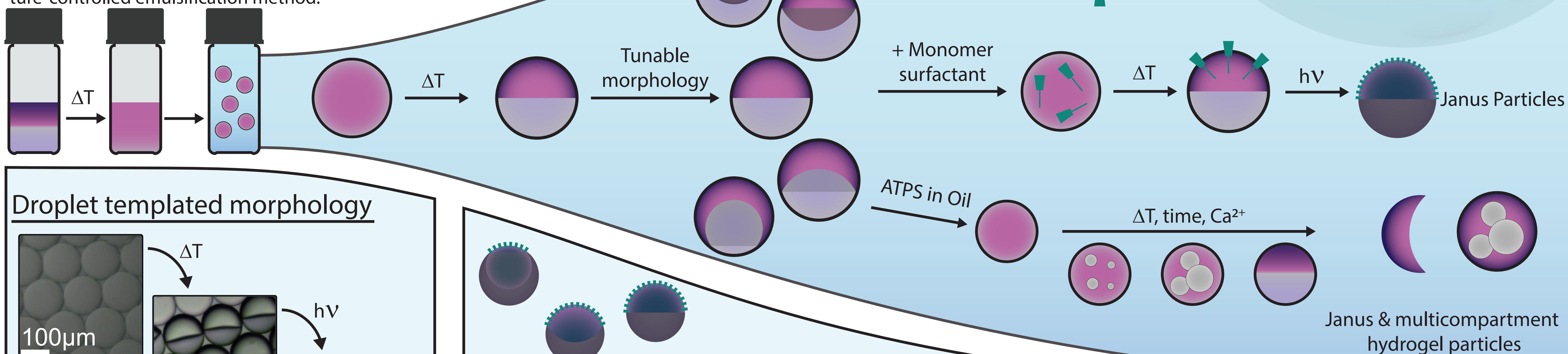
We are motivated to explore the design and synthesis of complex particles with a simple, scalable idea. Janus particle generation often requires specific synthesis, are limited in additives, surface functionality, or scalability due to microfluidic generation. We utilize complex emulsions as particle molds, with interfacial design and assembly to enable full control over the resulting particle.

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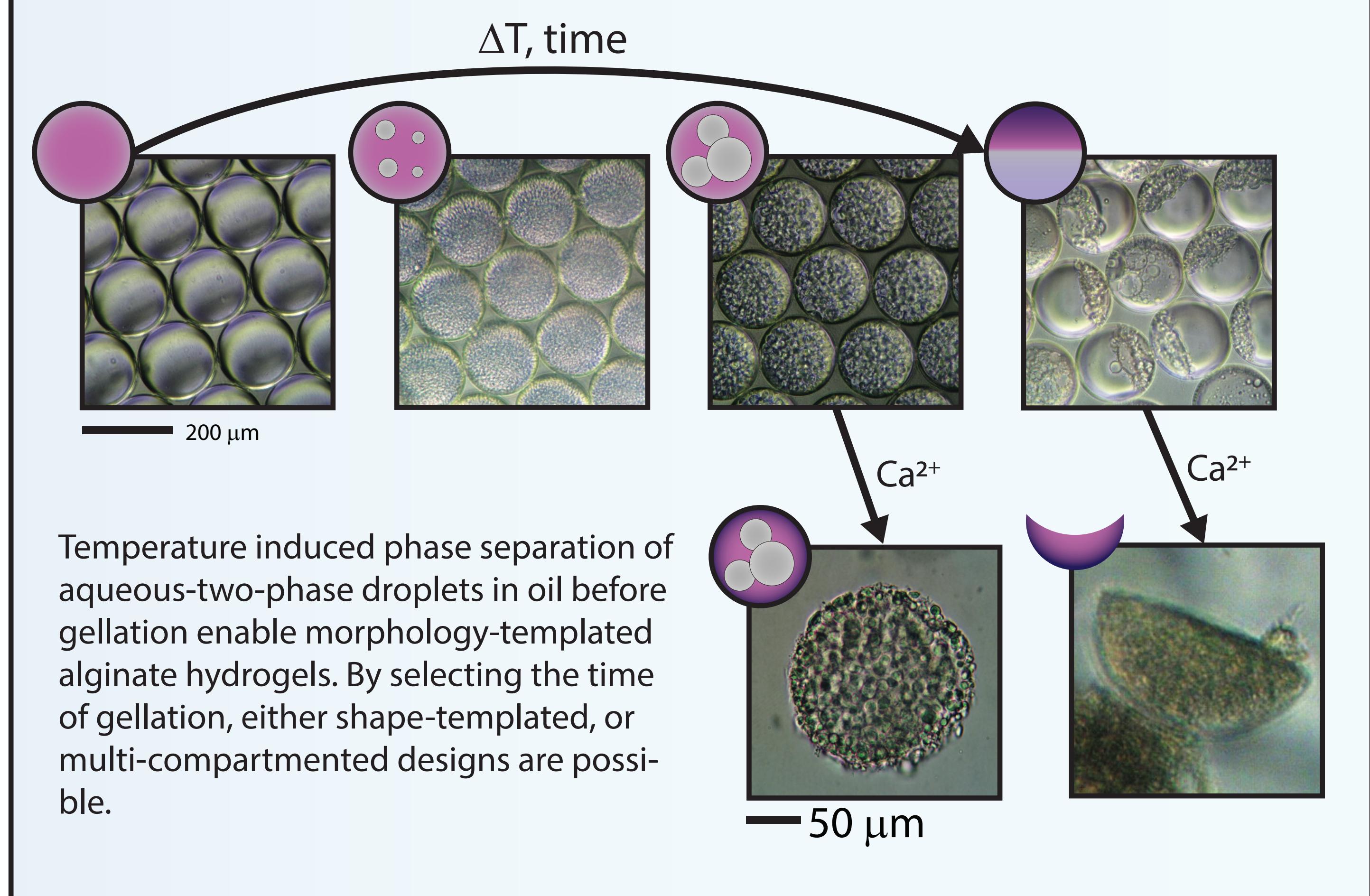


Synthesis

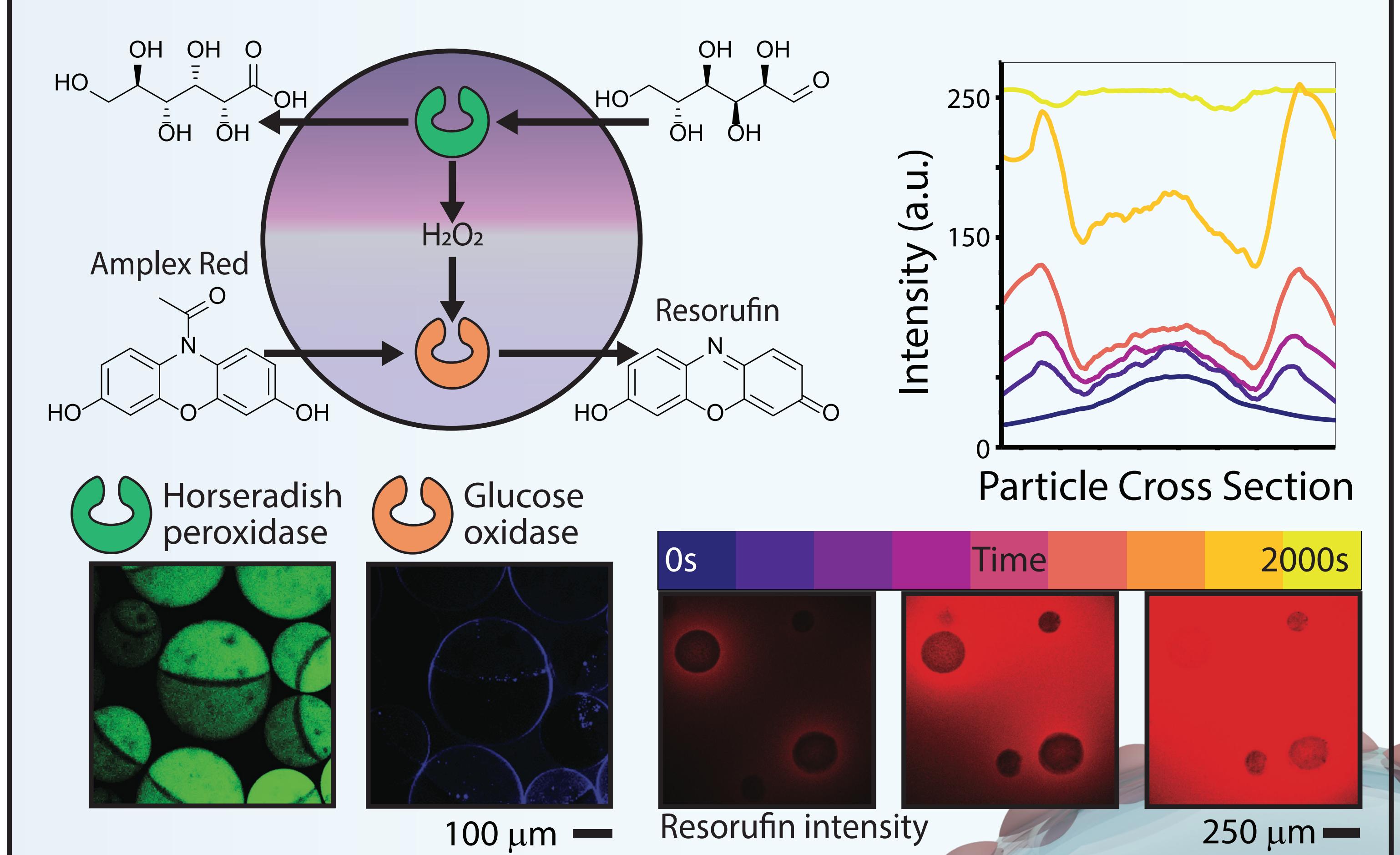
Complex double emulsion molds formed from either oil-in-water, or water-in-oil ATPS enable morphology-templated particles. Hydrocarbon and fluorocarbon phases with a low upper critical solution temperature reversibly mix with heat, and allow the generation of particles with any temperature-controlled emulsification method.



Complex emulsion-templated hydrogels



Membraneless confinement for cascade microreactors



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[1] Bradley D. Frank, Markus Antonietti, and Lukas Zeininger, "Structurally Anisotropic Janus Particles with Tunable Amphiphilicity via Polymerization of Dynamic Complex Emulsions". *Macromolecules* 2021 54 (2), 981-987

[2] Bradley D. Frank, Milena Perovic, Saeveh Djalali, Markus Antonietti, Martin Oschatz, and Lukas Zeininger, "Synthesis of Polymer Janus Particles with Tunable Wettability Profiles as Potent Solid Surfactants to Promote Gas Delivery in Aqueous Reaction Media". *ACS Applied Materials & Interfaces* 2021 13 (27), 32510-32519

[3] Marko Pavlovic, Markus Antonietti, Bernhard V.K.J. Schmidt, Lukas Zeininger, "Responsive Janus and Cerberus emulsions via temperature-induced phase separation in aqueous polymer mixtures". *Journal of Colloid and Interface Science* 2020, 575, 8-95



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