Assembly of 2D Particles at Fluid-Fluid Interfaces to Architect Advanced Composite Materials

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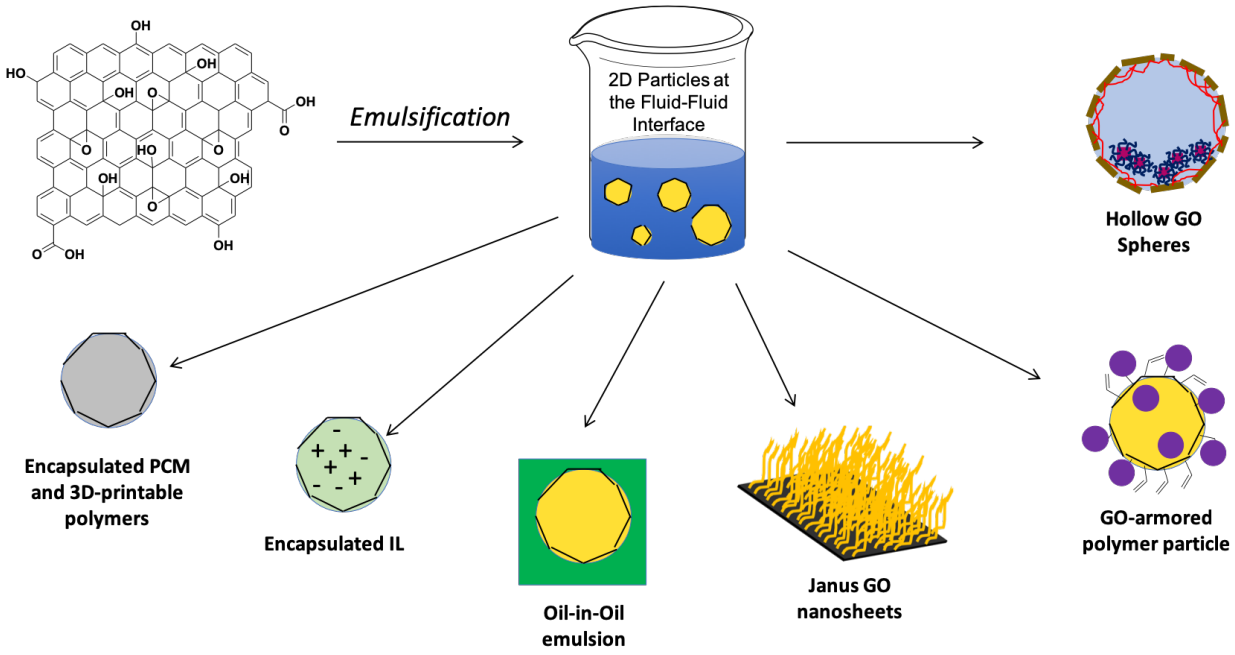

The interface between two fluids is not only important for defining reactivity of dislike materials, but it is also useful in the preparation of stable higher order structures. The Pentzer lab has developed 2D carbon-based nanosheets that assemble at different fluid-fluid interfaces including oil-water, oil-oil, ionic liquid-water, and ionic liquid-oil and demonstrated the use of these Pickering emulsions to template higher order composite structures. Graphene oxide (GO) and its functionalized analogues are used as the 2D particle surfactants, and are especially attractive given they have properties distinct and complimentary to the more commonly studied spherical and rod-like counterparts, and because these nanosheets are multifunctional (e.g., antimicrobial, good gas barriers, precursor to electrically conductive nanosheets, etc.). Recent advances from the Pentzer lab will be reported, including preparation of Janus nanosheets, oil-in-oil emulsions, encapsulated ionic liquids, compartmentalization of phase change materials, and GO coatings for 3D printable polymers to prepare conductive structures. This work makes use of fundamental organic chemistry reactions and thus gives access to unique structures and assemblies of interest for a broad range of applications in a scalable fashion.