Drop microfluidics: A versatile and promising approach for fabricating functional granular materials

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Abstract: Functional granular materials with typical sizes of 1~1000 μm have received considerable attention for many applications. Generally, the overall functions of these microparticles strongly rely on both of their structures and the properties of their component materials. Thus, the combination of unique structures with functional materials provides an important route for developing advanced functional granular materials. Utilization of emulsions as templates allows producing versatile microparticles, with their size, shape and structure largely depends on those of the emulsions. Emulsion-template synthesis of microparticles allows precise control over their size, shape, composition and structure by tuning those of emulsions via specific emulsification techniques. With excellent control over emulsion drops, microfluidic technique provides a powerful platform for reproducible and scalable production of granular materials with unprecedented control over their structures and compositions. This provides vast opportunities for producing granular materials with the structure-property combination strategy for achieving elaborately designed functions. The controllable architectures of the emulsions and their tunable chemical composition for each separate phase allow for flexible combination of the structure characteristics and material properties for producing microparticles with elaborately tailored functions. In this presentation, we highlight the recent efforts for microfluidic fabrication of granular materials with well-designed functions, along with the development of microfluidic techniques for producing the versatile emulsion templates.[1-3] We envision that the versatility of microfluidics for microparticle synthesis could open new frontiers and provide promising and exciting opportunities for fabricating brand-new functional microparticles with broad implications for myriad fields.

References:

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