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Conformal coating of non-spherical magnetic particles using microfluidics BYEONG-UI MOON, NAVID HAKIMI, DAE KUN HWANG, SCOTT TSAI, Ryerson University, DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING TEAM, DEPARTMENT OF CHEMICAL ENGINEERING COLLABORATION — We present the conformal coating of non-spherical magnetic particles in a microfluidic channel. We first prepare three-dimensional (3D) bullet-shaped magnetic microparticles using stop-flow lithography. We then suspend the bullet-shaped microparticles in an aqueous solution, and flow the particle suspension with a co-flow of a non-aqueous mixture. A magnetic field gradient from a permanent magnet pulls the microparticles in the transverse direction to the fluid flow, until the particles reach the interface between the immiscible fluids. In a physical domain characterized by a low particle Reynolds number and a high magnetic Bond number, we observe that the microparticles cross the oil-water interface, and then become coated by a thin film of the aqueous fluid. When we increase the two-fluid interfacial tension by reducing the surfactant concentration, we observe that the particles become trapped at the interface. We use this observation to approximate the magnetic susceptibility of the manufactured non-spherical microparticles, which are not known a priori. Using fluorescence imaging, we confirm the uniformity of the thin film coating along the surface of the bullet-shaped particles.

Byeong-Ui Moon
Ryerson University

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