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Controlling the interaction between two rolling microcapsules on elastic substrates ANNA BALAZS, ALEXANDER ALEXEEV, ROLF VERBERG, Chemical Engineering Department, University of Pittsburgh, Pittsburgh, PA — We study the interaction between two rolling capsules, which model polymeric microcapsules or blood cells. Each capsule consists of an elastic shell that is filled with a viscous fluid. The capsules are driven by an imposed flow to roll along a compliant substrate. To model this multi-component system, we combine the lattice Boltzmann model for fluid dynamics and the lattice spring model for the micromechanics of elastic solids. This technique allows for a dynamic interaction between moving, elastic walls and the surrounding fluid. We determine how the mechanical properties of the substrate and the capsules, and the characteristics of the imposed flow, affect the dynamic behavior of two closely placed capsules. We find that the stiffness of the capsules and the substrate affects the relative motion of the capsules on the surface, i.e., by tuning the mechanical properties, the separation between the capsules can be increased or decreased as they move along the surface. The results provide guidelines for designing micro-reactors that utilize elastic capsules to transport reagents and carry out reactions.

Anna Balazs
Chemical Engineering, University of Pittsburgh, Pittsburgh, PA

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