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**Cleaning by surfactant gradients: the importance of rinsing in fabric cleaning** SANGWOO SHIN, University of Hawaii at Manoa, PATRICK WARREN, Unilever R&D Port Sunlight, HOWARD STONE, Princeton University — Removing particles from fibrous materials involves loosening via surfactants followed by particle transfer in a flow. While flow advection is commonly believed to be the major driver for pore-scale transport, small pores within the fabric do not allow any significant fluid flow inside them, thus significantly reducing the role of advection. However, rinsing the fabric with fresh water naturally establishes a surfactant gradient within the pore space, providing a suitable environment for particles to undergo diffusiophoresis. We demonstrate that this mechanism can remove particles from deep within narrow fabric pores. Moreover, the non-linear aspect of diffusiophoresis significantly prolongs the lifetime of the phoretic motion beyond the naive solute diffusion timescale, allowing long-lasting, continuous removal of particles.

Sangwoo Shin
University of Hawaii at Manoa

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