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Using patterned surfaces to sort elastic microcapsules ALEXANDER ALEXEEV, ROLF VERBERG, ANNA C. BALAZS, Chemical Engineering Department, University of Pittsburgh — For both biological cells and synthetic microcapsules, mechanical stiffness is a key parameter since it can reveal the presence of disease in the former case and the quality of the fabricated product in the latter case. To date, however, assessing the mechanical properties of such micron scale particles in an efficient, cost-effective means remains a critical challenge. By developing a three-dimensional computational model of fluid-filled, elastic spheres rolling on substrates patterned with diagonal stripes, we demonstrate a useful method for separating cells or microcapules by their compliance. In particular, we examine the fluid-driven motion of these capsules over a hard adhesive surface that contains soft stripes or a weakly adhesive surface that contains "sticky" stripes. As a result of their inherently different interactions with the heterogeneous substrate, particles with dissimilar stiffness are dispersed to distinct lateral locations on the surface. Since mechanically and chemically patterned surfaces can be readily fabricated through soft lithography and can easily be incorporated into microfluidic devices, our results point to a facile method for carrying out continuous "on the fly" separation processes.

Alexander Alexeev
Chemical Engineering Department, University of Pittsburgh

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