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Conformation-triggered flow instability in monolayer thick polymer films SERGEI SHEIKO, HUI XU, DAVID SHIRVANYANTS, University of North Carolina at Chapel Hill, KATHRYN BEERS, NIST, KRZYSZTOF MATYJASZEWSKI, Carnegie Mellon University, MICHAEL RUBINSTEIN, University of North Carolina at Chapel Hill, ANDREY DOBRYNIN, University of Connecticut
— Here we have report on a new type of flow instability triggered by conformational changes of brush-like macromolecules as they spread on a solid substrate. By tracing the movement of individual molecules by atomic force microscopy, we were able to follow the evolution of the instability pattern on the molecular level enabling a microscopic understanding of the underlying physical mechanism. The instability is an analog of the Saffman-Taylor instability in thin films. However, the instability is driven by a variation in flow velocity controlled by molecular conformation instead of a viscosity gradient.

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