

Scrutinizing evidence of no dilatancy upon stick–slip of confined fluids

The question whether shear couples to dilatancy at the stick–slip transition of confined fluids is raised in a recent PNAS paper, and the authors report discovery of a null experimental result within their experimental resolution (1). Although novelty is claimed in making this measurement, in fact an older literature of similar experiments disagrees.

Decided dilatancy was reported 15 y ago (2) for exactly the same system studied in this new paper by Rosenhek-Goldian et al. (1), and was shown to hold generally for other confined liquids also (2, 3). The amplitudes of ~ 0.05 nm, below the experimental resolution of the present study (1), amount to one-tenth of the

molecular dimension, and hence are significant for understanding structural packing of films just a few molecules thick. Physically, dilation allows mean density to decrease, allowing sliding of liquids so thin that their granular nature comes into play.

Given the poorer experimental resolution of Rosenhek-Goldian et al.'s study (1), the recent findings concerning dilatancy are reassuringly consistent with the earlier findings and the asserted arguments do not stand. We consider that controversy in this field is too persistent (4).

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- 1 Rosenhek-Goldian I, Kampf N, Yeredor A, Klein J (2015) On the question of whether lubricants fluidize in stick–slip friction. *Proc Natl Acad Sci USA* 112(23):7117–7122.
- 2 Dhinojwala A, Bae SC, Granick S (2000) Shear-induced dilation of confined liquid films. *Tribol Lett* 9(1-2):55–62.
- 3 Demirel AL, Granick S (2002) Lubricated friction and volume dilatancy are coupled. *J Chem Phys* 117(16):7745–7750.
- 4 Granick S, Bae SC, Kumar S, Yu C (2000) Confined liquid controversies near closure? *Physics* 3:73–75.

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