Seminar/Talk

Glassy Nanofluidics: How collective liquid dynamics shape interfacial transport

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Van-der Waals friction of liquids on solid surfaces involves the matching of liquid and solid dynamical modes. In a recent work, we used glycerols glassy nature to tune the liquids molecular frequency over several decades. Using a custom tuning-fork AFM, we probed the friction of supercooled glycerol on mica across a range of temperatures [1]. We observe a 100-fold increase in slip length upon cooling, and demonstrate that friction scales linearly with the liquid's relaxation rate at high temperature. This scaling reveals a resonant coupling between substrate phonons and liquid density fluctuations, suggesting that phononic engineering could be a powerful strategy to control flow resistance in nanoscale systems.Building on the idea to use glassy liquids in nanofluidics, I will further discuss the effects of dimensionality on glass transition [2]. Here, we confine a single monolayer of glycerol within atomically smooth, 7-thick 2D channels built from graphite, realizing the first bidimensional molecular glass former. Through temperature-dependent ionic conductivity measurements, we find very surprisingly that glycerol remains cooperative in 2D in a striking similarity with the 3D behavior. Molecular dynamics simulations confirm this picture and even, suggest that confinement alone can amplify glassy correlations rather than suppress them.Together, these two approaches unveil the impressive conceptual wealth of glassy nanofluidics. This emerging framework opens new avenues for tuning interfacial transport and kinetics in biological and catalytic systems, especially as glassy liquids are already widespread in nature and industry.[1] Lize, M., Coquinot, B., Mariette, G., Siria, A., & Bocquet, L. (2024). Anomalous friction of supercooled glycerol on mica. Nature Communications, 15(1), 6129.[2] Not published yet

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Sunstone Bldg / Ground floor / Big Seminar Room B / 63 seats (I23.EG.102)

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