

APS DIVISION OF FLUID DYNAMICS PRACTICE TALKS

SPEAKERS: XINGCHEN SHAO, DI LI

“Mechanically-excited surface waves on soft agarose gels”---Shao

Rayleigh waves are widely used in non-destructive testing and in the study of seismology. Generally, Rayleigh waves are non-dispersive, and surface tension is not considered since the surface energy is so much smaller than the elastic energy in most solids. Herein we explore surface waves on ultra-soft solids where surface tension forces are not insignificant and where dispersion may exist. Agarose gel was explored for a range of shear moduli. Faraday waves were created on the agarose gel surface by vibrating the gel on a shaker for frequencies ranging from 40Hz to 200Hz. It was observed that the surface waves are dispersive for a range of shear moduli, an observation that cannot be explained by Rayleigh wave theory. A new analytical model that incorporates the solid surface tension was developed and explains the experimental observations.

“Fluid rheological effects on particle migration in rectangular microchannels”---Li

There has been an increasing interest in the use of viscoelastic solutions for particle focusing and separation in microfluidic devices. These passive manipulations arise from the flow induced elastic lift force that interacts with the inertial lift force for an enhanced control of particle motions. The rheological properties of the suspending fluid are supposed to have a significant impact on particle migration in microchannels. We present in this work an experimental investigation of the elastic and/or inertial focusing of polystyrene particles suspended in the flow of four types of fluids with varying rheological properties through a straight rectangular microchannel. Such a fundamental study is expected to provide useful data for fluid rheological effects on particle migration, which may be used to validate theoretical models.

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