Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Surface shear viscosity effects on the damping of oscillations in millimetric liquid bridges MIGUEL A. HERRADA, Escuela Técnica Superior de Ingenieros, Universidad de Sevilla, E-41092-Sevilla, Spain, JOSÉ M. MONTANERO, Escuela de Ingenieros Industriales, Universidad de Extremadura, E-06006-Badajoz, Spain, JOSÉ M. VEGA, E.T.S.I. Aeronáuticos, Universidad Politécnica de Madrid, 28040-Madrid, Spain — The damping rate of the small free oscillations in a non-cylindrical, axi-symmetric liquid bridge between two circular disks is calculated and compared with some previous experimental measurements using hexadecane in a millimetric liquid bridge. Current theories, accounting for viscous damping in both the boundary layers attached to the disks and the bulk, underestimated the measured damping by a $O(1)$ quantity. Calculations based on the full Navier-Stokes equations are also in disagreement with the experimental results. These discrepancies are essentially eliminated in this work considering the effect of the surface shear viscosity (whose value results from empirical fitness), which could be due to the presence of a contaminating monolayer. Some conclusions are extracted in connection with surface wave damping in micro-fluidic devices.

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Date submitted: 27 Jul 2011 Electronic form version 1.4