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Nonlinear evolution of a dewetting bilayer thin film on a soft-gel layer PUSHPAVANAM SUBRAMANIAM, DINESH BHAGAVATULA, Indian Institute of Technology Madras — The nonlinear evolution of dewetting bilayer thin film on a soft-gel is investigated in this work. The fluids are considered to be Newtonian and the soft-gel-layer is modelled as a linear viscoelastic solid. The free surface of the top fluid is exposed to air. The van der Waals attractive forces between the soft-gel layer and the fluids are the primary driving forces responsible for breaking of the thin films. Short range repulsive forces play a key role in the dynamics of the system for very thin bilayers. The nonlinear evolution equations for this system are derived using a lubrication approximation. Linear stability analysis of the system confirms two long wave instabilities one at the liquid-liquid interface and other at the free surface arise in the system. The liquid-liquid instability is dominant when the attractive forces between the soft-gel-layer and the bottom fluid are strong. For a range of parameters both instabilities coexist in the system. The short range repulsive forces can suppress both these instabilities. The soft-gel layer has a destabilizing effect on the long wave instabilities.

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