Abstract Submitted
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The Elasto-capillary Landau-Levich Problem[1] GEORGE HOMSY, HARISH DIXIT, University of British Columbia — We consider the dip-coating flow problem when the interface has both an elastic bending stiffness and a constant surface tension. In the case where interfacial tension is negligible, we assume the elasticity number El - the ratio of surface elasticity to viscous forces - is small and develop the solution for the free boundary as a matched asymptotic expansion in powers of $El^{1/7}$, thus determining the film thickness as a function of El. A remarkable aspect of the problem is the occurrence of multiple solutions, and five of these are found numerically. In any event, the film thickness varies as $El^{4/7}$, or equivalently, $U^{4/7}$, where U is the plate speed, in agreement with previous experiments. The solution for the elasto-capillary problem is formulated in a similar way, with an elasto-capillary number, ϵ, (the ratio of elasticity to surface tension), as an additional parameter. It is possible to connect the problems of pure elasticity and elasto-capillarity respectively through the parameter ϵ, but connecting one of the five elasto-capillary branches to the classical Landau-Levich result result remains an elusive goal.

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