Abstract Submitted
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Transient coating of substrates with variable topography by viscous films[1] NIKOS LAMPROPOULOS, YIANNIS DIMAKOPOULOS, JOHN TSAMOPOULOS, Univ of Patras — We study the transient coating of substrates exhibiting orthogonal trenches. We use the VoF method via OpenFOAM to solve the transient NS eqs on an unstructured grid, which dynamically undergoes local refinement around the interfaces. An Euler implicit method is used with adjustable time-step. The computational cost is reduced by parallel execution via MPI. Completely different wetting patterns result depending on the 3 dimensions of the topography, the capillary and Reynolds numbers and the dynamic contact angle. On one hand, continuous coating can be achieved in which the thin film of fluid wets the entire trench, while a steady flow is established upstream and downstream the topography. This is the desirable pattern in coating microelectronic devices for their protection and planarization. The other extreme possibility is that the film completely bypasses the trench, entrapping air inside it. This pattern reduces the drag coefficient on the film and, therefore, it is desirable in super-hydrophobic surfaces for microfluidic applications. Between these two extremes, a large variety of patterns exists in which the film partially wets the trench forming an air inclusion all along its bottom surface or its upstream or downstream inner corners or the film may breakup periodically. We produce comprehensive maps of film configurations covering a wide range of parameter values.

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