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Impact of Microdrops on Solids: Modelling and Simulation JAMES SPRITTLES, YULII SHIKHMURZAEV, University of Birmingham — A major obstacle to the design of ink-jet printing devices for targeted deposition of microdrops is that the interaction of a microdrop with a solid substrate cannot be inferred from experiments with larger drops, whose behaviour is relatively easy to observe. Consequently, it is necessary to have a theory based on first-principles which, once verified against large-drop experiments, can take one down to the dimensions unaccessible to experiments. In this work, the behaviour of spreading microdrops is examined, over a wide range of parameter space, and results obtained using different theories for the dynamic wetting process are compared. This is achieved by developing a numerical code which incorporates, besides the conventional 'slip models' for the moving contact line, the more mathematically complex theory of interface formation. The results of our microdrop simulations allow one to indicate clear, experimentally verifiable, qualitative differences between the models' predictions. In particular, the transition between different flow regimes, such as deposition or rebound of the microdrop, is seen to be strongly dependent on the treatment of the dynamic contact angle. Variations in wettability, which influence the flow by altering the equilibrium properties of the liquid-solid interface, are naturally incorporated into the framework and are seen to provide novel methods of flow control.

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