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Capillary wrinkling of thin floating films[1] JIANGSHUI HUANG, Department of Physics, University of Massachusetts-Amherst, WIM H. DE JEU, FOM Institute for Atomic and Molecular Physics, Amsterdam, The Netherlands, NARAYANAN MENON, Department of Physics, University of Massachusetts-Amherst, THOMAS P. RUSSELL, Department of Polymer Science and Engineering,University of Massachusetts-Amherst — We study the wrinkling instability induced in freely-floating polystyrene films, tens of nanometers in thickness, by the interfacial tension of tiny drops of water placed on their surface. The wrinkling pattern is characterized by the number, N, and length, L, of the wrinkles. The dependence of N on the elastic properties of the sheet and on the capillary force exerted by the drop provides a detailed experimental test of recent theoretical predictions on wavelength selection in the wrinkling instability. A scaling relation is developed for the length of the wrinkles. These scaling relations for the number and length of the wrinkles demonstrate the basis for a metrology of the elasticity and thickness of extremely thin films that relies on no more than a dish of fluid and a low-magnification microscope.

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