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Imaging surface mechanical properties of complex polymer thin films using Intermodulation Atomic Force microscopy DANIEL FORCHHEIMER, DANIEL PLATZ, DAVID B. HAVILAND, Royal Institute of Technology (KTH), Stockholm, Sweden, ERIK A. THOLÉN, Intermodulation Products AB, Solna, Sweden — The atomic force microscope (AFM) has been the method of choice to measure surface topography of thin films on the sub-micron scale. In addition to topography, dynamic AFM, where the cantilever is oscillated at its resonance frequency, gives a qualitative image of material heterogeneity by recording the phase lag of the oscillation. As new materials become increasingly more complex, containing multiple components and phases, there is an increased need for more sensitive and also more quantitative characterization polymer surfaces at the nanometer scale. We have developed Intermodulation AFM in which the cantilever is excited at two frequencies close to resonance. By measuring the intermodulation products, or mixing products, of the drive frequencies more information regarding the tip-surface interaction is revealed, providing better material contrast and allowing quantitative reconstruction of the tip-surface force curve. We have applied this method to the study of thin films of polymer blends and block copolymers in which it was possible to quantify material stiffness of the different phases of the material and relate those to quantitative measurements of the pure polymer components.

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