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Chemical Imaging of the Surface of Polymeric Nanostructures Using Apertureless Near-Field IR Microscopy ZAHRA FAKHRAAI, KERSTIN MUELLER, MELISSA PAULITE, XIUJUAN YANG, GILBERT C. WALKER, Department of Chemistry, University of Toronto, Toronto, ON, M5S 3H6, Canada — The chemical composition of the surfaces of thin films of polystyrene-poly (methyl methacrylate) (PS-PMMA) diblock copolymers are investigated using apertureless near-field IR microscopy. In this technique a tunable IR beam is scattered from an oscillating atomic force microscopy tip. The scattered light is enhanced using a reference signal with the same optical frequency (homodyne) or slightly shifted IR frequency (heterodyne) and detected after demodulation in order to eliminate the background scattering. Using this technique a lateral chemical imaging resolution of <20 nm is achievable. It is demonstrated that this technique can be successfully used to image the surface of PS-PMMA diblock copolymers. It is shown that an increase in the IR absorption is observed in the PMMA rich domains with a wavenumber dependence that is consistent with the bulk absorption spectrum. The results indicate that even though a topography induced artifact can be observed, when homodyne detection technique is used, the chemical signature of the sample can be detected clearly. This technique can be further used in a variety of different systems to detect the surface structure of polymers or proteins.

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