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Nano-spectroscopic vibrational chemical imaging of block-copolymer phase behavior BENJAMIN POLLARD, MARKUS B. RASCHKE, University of Colorado Boulder — Block copolymers phase-separate to form a wide range of different types of structures on mesoscopic length scales, controlled by relative chain lengths, solvent, and substrate interactions. However, the investigation of their complex phase behavior has remained difficult using traditional scanning-probe techniques due to a lack of the desired nanoscale chemical specificity. Here, we demonstrate the combination of scattering Scanning Near-field Optical Microscopy (s-SNOM) with ultrahigh sensitive infrared vibrational spectroscopy to provide compositional mapping on the sub-domain level. Probing the carbonyl resonance in thin films of poly(methylmethacrylate)-b-polystyrene (PMMA:PS) diblock copolymers, we identify distinct local PMMA density distributions and surface terminations comparing micellar and lamellar structures. With this technique we demonstrate an infrared spectroscopic sensitivity as high as a few 100 monomers and 10 nm spatial resolution. We discuss the extension to related soft-matter systems, including self-assembled monolayers and biomaterials.

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