

Abstract Submitted
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GISAXS Study of Lateral Instability in Nanoimprinted Polymer Gratings YELING DAI, OLEG SHPYRKO, Department of Physics, University of California, San Diego, KYLE ALVINE, Pacific Northwest National Lab, JOSEPH STRZALKA, ALEC SANDY, APS, Argonne National Lab, HYUN WOOK RO, CHRISTOPHER SOLES, NIST — We experimentally investigate thermal decay instability that occurs in nanoimprinted lithography (NIL) polymer nanostructures. Thermal stability of soft polymer imprinted nanoscale patterns is a major challenge for NIL applications. Due to Laplace pressure, polymer patterns develop instability that reduces surface energy during annealing. Time-Resolved Grazing Incident Small Angle X-ray Scattering (GISAXS) allows us to precisely measure in-situ development of such thermal instability process with nanoscale resolution and timescale down to 10 ms. In addition to the conventional exponential pattern height decay, we also observe a lateral instability of the polymer lines during heating above glass transition temperature. This lateral instability is marked by an out-of-phase lateral “zigzag” undulation of the polymer lines and a local coalescence of the lines as they approach one another. We will show how this behavior can be studied with time-resolved GISAXS by characterizing instability parameters such as undulation wavelength, correlation lengths, pattern height etc.

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