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Two-dimensional order-disorder (melting) transition in a diblock copolymer cylinder-forming thin-film system. WEINING MAN, Physics department, Princeton University, DAN E. ANGELESCU, Schlumberger-Doll Research, MINGSHAW W. WU, VINCENT PELLETIER, Physics Department, Princeton University, DOUGLAS H. ADAMSON, PRISM, Princeton University, RICHARD A. REGISTER, Chemical Engineering Dept., Princeton Univ., PAUL M. CHAIKIN, Physics Department, Princeton University — We have studied the phase diagram of a two dimensional smectic system, a monolayer film of di-block copolymer cylinders. Previous work was done on sphere-forming diblock polymer films. In this work we anneal PS-PEP 5-13 cylinder-forming diblock copolymer using a temperature gradient system, to investigate the orientational order-disorder (melting) transition. We find that on the high temperature side correlation lengths are very small, revealing complete lack of orientational order. This corresponds to annealing far above the order-disorder (or melting) transition. The disordered state in this case is a thermodynamic equilibrium state, continued annealing of the sample will not produce more ordering in this region of the sample. The order-disorder transition, ODT, occurred at $\approx$ 163 oC, higher than the bulk ODT of the same polymer (TODT =144 ^{o}C). We present data on the temperature dependence of the correlation functions and the densities of topological defects. By lowing the temperature of the high T end of the gradient, we can also sweep the temperature gradient to study the effects of zone refining.

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