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Effects of confinement on the order-disorder transitionin diblock copolymer melts and crystallization DADONG YAN, BING MIAO, CHARLES C. HAN, PPCL, Joint Laboratory of Polymer Science and Materials, Institute of Chemistry, Chinese Academy of Sciences, Beijing 100080, China, AN-CHANG SHI, Department of Physics and Astronomy, McMaster University, Hamilton, Ontario L8S 4M1, Canada — The effects of confinement, in terms of size and geometry, on the order-disorder transition (ODT) in diblock copolymer melts are studied theoretically. Confinements are applied by restricting diblock copolymers in given geometries of slab, cylinder and sphere, respectively. Within the frame of self- consistent field theory, the second-order fluctuation of free energy functional is studied, and its minimum determines the spinodal point of the homogeneous phase. For the slabs and cylindrical cases the spinodal point $(\chi N)_s$ of the homogeneous phase is independent of the confinement, while in spherical case $(\chi N)_s$ is increased except some suitable radius of the sphere. In addition, using the idea that before nucleation there are fluctuations of the orientation of polymer chains, the puzzling direction of lamellae in the crystallization under confinement can be explained.

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