SCFT Studies on the Phase Transitions and Domain Spacing of the Bottlebrush Copolymers \(^1\) DACHUAN SUN, JUNHAN CHO, Department of Polymer Science and Engineering, Dankook University, South Korea — Using the self-consistent mean filed theories, the order-disorder transitions (ODT) values \((N \chi)_{\text{ODT}}\) are calculated for AB bottlebrush copolymers with different lengths of the backbone and grafted chains, or with different chain-length-ratio between the grafted A and B chains. Increasing the fractions of the grafted chains gives a disordering effect on the microphases and causes the \((N \chi)_{\text{ODT}}\) values to increase. Contrarily, increasing the backbone fraction yields an ordering effect and causes the \((N \chi)_{\text{ODT}}\) values to decrease. For copolymers with the branches of the same sizes, the domain spacing \(D\) depends on the backbone length. Its scaling exponent firstly increases and then decreases with the increase of the graft chain length. The domain spacing \(D\) increases with the length of the grafted chains \(r_G\) for bottlebrush copolymers with the same backbone. In weak segregation level, the SCFT calculations indicate that \(D \propto r_G^{0.30}\), which reveals the smaller exponent than that predicted recently by the strong segregation analysis (0.35).

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