New Morphologies of Block Copolymers with Ingenious Molecular Design

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Several complex copolymer systems are employed to create new bulk morphologies. The first class of systems is binary blends of poly(isoprene-b-styrene-b-2-vinylpyridine) triblock terpolymers with different block chain lengths. These blends give 1) tetragonally-packed rods in matrix, 2) unusual tiling patterns with extremely large unit cells, and 3) bicontinuous double diamond structures. The second one is an ABCD tetrablock quarterpolymer, by which continuous gyroid structure having the *gyroid* surface at B-C interface was first found and confirmed. The third class is bottle-brush type SIn(S:polystyrene, I:polyisoprene) block-graft copolymers, several interesting structures with non-constant interfacial curvatures have been found, among them particular interest is focused on the complex structure called A-15, where bcc and hcc assemblies of spherical domains in matrix are realized simultaneously.