

Multidomain Helical Nanostructure by A_1BA_2C Tetrablock Terpolymer Self-assembly윤형건, 김진곤[†]

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Among many possible nanostructures in block copolymer self-assembly, helical nanostructures are particularly important because of potential applications for heterogeneous catalysts and plasmonic materials. In this work, we investigated, via small angle X-ray scattering and transmission electron microscopy, the morphology of polystyrene-block-polyisoprene-block-polystyrene-block-poly(2-vinyl pyridine) (S_1IS_2V) tetrablock terpolymer. Very interestingly, when the volume fraction of each block was 0.685, 0.125, 0.060, and 0.130, respectively, multidomain double-stranded helical nanostructure (MH_2) was formed: P2VP chains became a core helix, and PI chains formed double-stranded helices surrounding the core helix. Core and double-stranded helices are connected by short PS_2 chains, and PS_1 chains become the matrix. The experimentally observed morphology is in good agreement with the prediction by self-consistent field theory. We believe that this multidomain helical structure will pave the way on the creation of multifunctional helical structures for various applications such as metamaterials.