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The Tricontinuous 3ths(5) Phase: A New Morphology in Copolymer Melts MICHAEL FISCHER, Adolphe Merkle Institute, Chemin des Verdiers 4, CH-1700 Fribourg, Switzerland, LILIANA DE CAMPO, Australian National Science and Technology Organisation, Bragg Institute, New Illawarra Road, Lucas Heights NSW 2234, Australia, JACOB KIRKENSGAARD, Niels Bohr Institute, University of Copenhagen, Universitetsparken 5, 2100 København, Denmark, STEPHEN HYDE, Applied Maths, Research School of Physics & Engineering, The Australian National University, Canberra ACT 0200, Australia, GERD SCHROEDER-TURK, Institut für Theoretische Physik, Friedrich-Alexander Universität Erlangen-Nürnberg, Staudtstr. 7B, 91058 Erlangen, Germany — Self-assembly remains one of the most efficient routes to the formation of ordered nanostructures, including the double gyroid network phase in diblock copolymers based on two intergrown network domains. This talk demonstrates the use of self-consistent field theory to show that a tricontinuous structure with monoclinic symmetry, called 3ths(5), based on the intergrowth of three distorted ths nets, is an equilibrium phase of triblock star-copolymer melts when an extended molecular core is introduced. The introduction of the core enhances the role of chain stretching by enforcing larger structural length scales, thus destabilizing the hexagonal columnar phase in favor of morphologies with less packing frustration. This study further demonstrates that the introduction of molecular cores is a general concept for tuning the relative importance of entropic and enthalpic free energy contributions, hence providing a tool to stabilize an extended repertoire of self-assembled nanostructured materials.

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