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Weak Segregation Theory of Microphase Separation in Block Copolymers: New Results and Perspectives. IGOR ERUKHIMOVICH, Moscow State University — The weak segregation theory (WST) of microphase separation in block copolymers (BC) is based on the vision by Landau (1937) and seminal breakthrough by Leibler (1980) into microscopic theory of as well as the Brazovskii-Fredrickson-Helfand (1975, 1987) understanding of the corresponding fluctuation effects. The WST is especially helpful in the situation when one tries to form the well reproducible ordered morphologies, for which purpose they are to be formed as smoothly as possible. Among other new results in this field, I address the following issues: *i*) non-conventional morphologies and phase transitions in the bulk and confined ternary ABC block copolymers; *ii*) the BC phase diagram control via their chemical modification involving thermoreversible association between the different blocks; *iii*) the WST analysis of the non-centrosymmetric lamellar structures in the blends of the ternary and binary BC; and *iv*) semidulute BC solutions as photonic crystals.

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