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Phase transitions in block copolymers induced by external fields

MARCO PINNA, ANDREI ZVELINDOVSKY, University of Central Lancashire, Preston, UK — By means of computer simulation we investigate structures formed by polymers consisting of several chemically different blocks, block copolymers. Aim of this contribution is to describe phase transitions between different structures induced by applied electric field and shear flow. We study behaviour of bicontinuous gyroid structure under electric field and compare it with the transition under shear flow. The transition demonstrates non-trivial topological transformations under various fields. We also study spherical, cylindrical, and lamellae phases. Depending on temperature the sphere morphology shows different behaviour under applied shear flow or electric field. We describe kinetics of sphere-to-cylinder transition. We found that about the critical value of electric field the spherical phase transforms into cylinders. While applying shear flow we find sphere-to-cylinders coexistence at one temperature and arrays of hexagonal ordered spheres at another temperature. The results are compared with the experiments and suggest ways of block copolymer structure tailoring.

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