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FORMATION OF COMPLEX MICELLES IN SOLUTIONS OF AB AND BC BLOCK COPOLYMERS

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We studied the stability of micelles with mixed corona in the mixture of AB and BC diblock copolymers in a selective solvent[1]. The B blocks were assumed to be insoluble and, thus, form a core of the micelle. The soluble blocks of A and C types are either homogeneously mixed within corona (the case of the mixed micelles) or they form "pure" A and C coronas (the so-called ordinary micelles). If incompatibility between A and C blocks is weak enough, mixed micelles are formed. Increase of the repulsion between A and C blocks leads to the stability of ordinary micelles.

The stability of 6 different structures was considered. These structures are mixed/ordinary spherical, cylindrical and lamellar morphologies (Fig. 1).

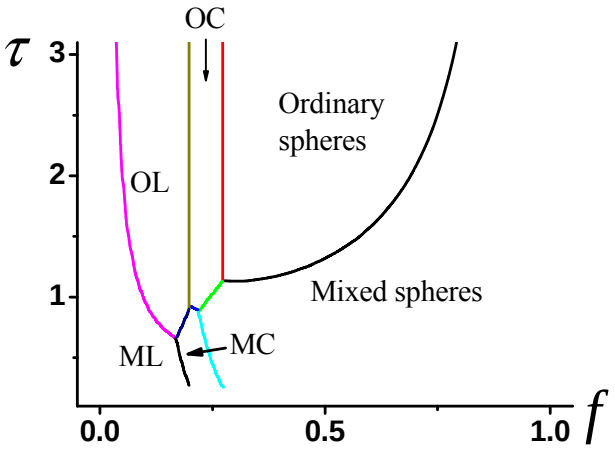

Fig. 1. Typical phase diagram. OC – ordinary cylinders, OL – ordinary lamellae, ML – mixed lamellae, MC – mixed cylinders. τ is the measure of incompatibility between A and C monomer units. *f* is a fraction of soluble block in diblock copolymer. Quantities of AB and BC copolymers in solution are equal to each other. Surface tensions between corona blocks and core block B are equal as well. The degree of polymerization of copolymers is 400.

We found that the increase of the surface tension on the core-corona interface leads to a shrinkage of the stability regions of the mixed micelles and to the shift of the boundaries of cylindrical phases towards larger fractions of soluble block in the copolymer. The decrease of overall lengths of the diblock copolymers results in narrowing of the stability regions of the mixed micelles as well.

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