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Nano-sized micellar drug delivery systems based on block copolymers

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We reported recently that the double hydrophilic block copolymers with the system of cooperative hydrogen bonds between chemically complementary blocks formed stable micelles in aqueous medium [1]. This special type of micelles contains hydrophobic "core" with H-bonded segments of interacting blocks and hydrophilic "corona" with free (unbound) segments of longer blocks. The given micellar structures have attracted a considerable attention due to their possible applications as different templates and drug delivery systems.

In the present work we represented the self-assembly of diblock copolymers based on poly(acrylic acid) (PAAc) and methoxypoly(ethylene oxide) (MOPEO) into micelles in aqueous solutions as a function of the solution pH. At the low pH, polyacid block of these copolymers was protonated and formed the intramolecular polycomplexes (IntraPCs) with MOPEO block. Due to both the IntraPCs formation and hydrophobic interactions between non-polar bound segments of the blocks, an intense micellization in copolymer solutions at pH<4 was developed. Parameters of the micellization process and the micellar stability at pH<4 (the CMC values and the Gibbs free micellization energies) were calculated using static light scattering. Morphology of DBC micelles and their nano-size were shown by TEM images.

The capability of given hydrophilic copolymer matrices to act as templates for the encapsulation of fat-soluble vitamin E (α-Tocopherol acetate was used as the stable vitamin E derivative) was established.

1. *T. Zheltonozhskaya, N. Permyakova, L. Momot*. In: Hydrogen-bonded interpolymer complexes. Formation, structure and applications, Ch.5 (New Jersey-London-Singapore-Beijing etc.: World Scientific, 2009).