POLYELECTROLYTE COMPLEXATION OF BLOCK COPOLYMER MICELLES WITH THE OPPOSITELY CHARGED SPECIES: FROM FUNDAMENTAL ASPECTS TO PERSPECTIVE APPLICATIONS

Lysenko E.A.

Lomonosov Moscow State University, Moscow, Leninskie Gory, 1/3
E-mail: ealysenko@rambler.ru

Spherical polyelectrolyte micelles with the hydrophobic core and lyophilizing charged corona are the products of association of macromolecules of ionogenic amphiphilic block copolymers in aqueous media. Such micelles can be regarded as self-assembling spherical polyelectrolyte brushes, containing huge amount (~10^3–10^5) of charged units, concentrated in a star-like fashion around a central core within a small space of several tenths nanometers. Practically all counterions are confined within the micelle corona, producing high osmotic pressure and strong elongation of polyelectrolyte blocks. Due to their unique organization polyelectrolyte micelles possess three characteristic features as counterparts of polyelectrolyte complexation reactions: (*a*) high binding affinity, (*b*) high encapsulation capacity and (*c*) high colloid stabilization capacity for various types of oppositely charged species: polyions, surfactant micelles, proteins, colloid particles, ions of multivalent metals, etc. Polyelectrolyte complexation reactions with participation of block-copolymer micelles as well as structure, properties, and perspective applications of their products - micelle polyelectrolyte complexes (*m-PEC*) - will be the subject of the lecture.

Key aspects that will be discussed are:

(i) Origins of high affinity of polyelectrolyte micelles towards oppositely charged species, tools for thermodynamic control of polyelectrolyte complexation reactions;
(ii) Origins of decelerated kinetics of complexation reactions with micelle participation, possibilities of kinetic control over the structure and dispersion stability of *m-PEC* in aqueous media;
(iii) Structure of *m-PEC* particles;
(iv) Possibilities of encapsulation of oppositely charged (equally charged in some cases) species within the micelle corona and their effective protection against environmental changes;
(v) Questions of dispersion stability of *m-PEC* particles with block copolymer micelles acting as a host or a guest polyelectrolyte;
(vi) Perspectives of *m-PEC* application as nanaocontainers, effective drug delivery vehicles, surface modification agents and nanoreactors.

On the whole we will see that *m-PEC* indeed may constitute a novel class of polyelectrolyte complexes with a promising potential of further fundamental and technological development.