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Thematic course: Protein-polyelectrolyte complexes. Part 2.

Complexes bovine serum albumin with carboxymethylcellulose. Effect of molecular weight of polyelectrolyte.

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Abstract

The interaction of bovine serum albumin in aqueous solution with sodium salt of carboxymethylcellulose with different molecular mass was studied. It is shown that, protein-polyelectrolyte complexes (PPC) forms because of macromolecular reactions, which are stabilized mainly by electrostatic forces. To characterize the PPC composition the φ parameter used, which is defines as the ratio of concentration of ionic groups of polyelectrolyte per mole of protein molecules. Using spectrophotometry is was established that, in the studied system when components are mixed under optimal conditions (ratio of components, pH of the solution) complexes are formed, the composition of which corresponds to φ ~60 ([carboxymethylcellulose – CMC]/[bovine serum albumin – BSA] = 0.2-0.25 g/g). The degree of conversation in reactions of protein with polyelectrolyte is close to 0.9. The region of existence of PPC established. The maximum yield of the product of interpolyelectrolyte reaction is fixed at pH ≤ 4 (ζ potential of BSA molecules is above +12 mV). The increase in the molecular mass of polyelectolyte shifts the point of beginning of intensive complexation into the area of high pH values, thus, increasing the diapason of interaction of components. The molecular mass of polymer electrolyte in protein-polyelectolyte systems should be considered as a factor that has a decisive influence on the structure of forming particles. The size of the forming complex particles depending on the PPC composition and on the molecular of polymer polyelectrolyte varies from 10 nm to 5.0 μm. The particles of micron size forms for CMC samples with molecular mass of $2.5\text{-}4.5 \cdot 10^5$ at a mass ratio of components in PPC 0.1, while the decrease in the molecular mass of polymer polyelectrolyte to $3.1 \cdot 10^4$ requires an increase of this value to 0.2. Short-chained polyelectrolytes are advisable to use to stabilize the protein macromolecules.

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