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Proteins immobilization on the surface of modified plant viral particles coated with hydrophobic polycations

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Two hydrophobic cations based on poly-*N*-ethyl-vinylpyridine were used to produce biologically active complexes. The complexes obtained from tobacco mosaic virus (TMV) spherical particles (SPs), hydrophobic polycation, and a model protein were stable and did not aggregate in solution, particularly at high ionic strengths. The nucleic acid-free SPs were generated by thermal remodeling of the TMV (helical rod-shaped plant virus). The model protein preserved its antigenic activity in the ternary complex (SP–polycation–protein). Immobilization of proteins on the surface of SPs coated with hydrophobic cation is a promising approach to designing biologically active complexes used in bionanotechnologies.

Keywords: biologically active complexes; hydrophobic polycations; spherical particles; tobacco mosaic virus

1. Introduction

Viruses and virus-like particles become more and more popular as a basis for immobilization of functionally active molecules in new biotechnologies. The main types of viral surface modification are genetic (biological), covalent (chemical), and non-covalent modifications based on the physicochemical properties of molecular structures.[1,2] For example, non-covalent immobilization was used for presentation of green fluorescent protein or canine oral papillomavirus protein conjugated with streptavidin on the surface of biotinylated tobacco mosaic virus (TMV).[3] Polymer and inorganic matrices are widely used for immobilization of bioactive compounds in different biotechnological processes.[4] Surface modification by deposition of the oppositely charged polyelectrolytes enables variation of physicochemical properties of the carrier, including its size, charge, and hydrophilic/hydrophobic balance, over a wide range.[5]

Earlier, we characterized spherical particles (SPs) generated by thermal remodeling (at 94 °C) of the coat protein (CP) of TMV virions. Size of SPs depends on the concentration of native TMV in the initial solution and it can be controlled. The protein in SP has denser packing when compared to native TMV, and it has total negative charge at neutral pH. SPs obtained as a result of TMV thermal treatment contain no RNA and are biologically safe, since animals and plants have no common pathogens. SPs are

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