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## Specifics of self-organization and properties of highly dilute aqueous solutions of polyoxidonium

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### Abstract

© 2016, Springer Science+Business Media New York. Using a combination of physicochemical methods (dynamic and electrophoretic light scattering (DLS and ELS, respectively), nanoparticle tracking analysis, atomic force and transmission electron microscopy (AFM and TEM, respectively), UV spectroscopy, conductometry, pH-metry, dielcometry), it was found that dilute solutions of a multicomponent drug immunomodulator polyoxidonium (PO) are nanoheterogeneous disperse systems, with their disperse phase undergoing considerable restructurings when diluting the solution in the range of calculated concentrations from  $1 \cdot 10^{-1}$  to  $1 \cdot 10^{-16}$  mg mL<sup>-1</sup>, which is reflected in the non-monotonous concentration dependencies of specific electroconductivity, dielectric permittivity, and pH of the solutions. Using ELS, AFM, TEM, and UV spectroscopy methods, it was found that the disperse phase with a size of hundreds of nanometers which forms at concentrations of  $\leq 1 \cdot 10^{-5}$  mg mL<sup>-1</sup>, contains organized water structures substantiating the negative values of  $\zeta$ -potential, which vary non-monotonously from -5 to -16 mV. Radioprotective properties of dilute solutions of PO ( $1 \cdot 10^{-1}$  and  $1 \cdot 10^{-9}$  mg mL<sup>-1</sup>) were demonstrated for the first time when exposing the test mutant bacterial strain *Salmonella typhimurium* TA 100 (Ames test) to X-ray radiation in a dose of 7.50 mGy used for medical diagnostics.

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### Keywords

aqueous nanoassociates, dilute solutions, disperse system, multicomponent drug immunomodulator polyoxidonium, radio-protective properties, self-organization, supramolecular domains