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Transformations of Spatial Distributions of Bio-Polymers and Nanoparticles in Water Suspensions Induced by Resonance-Like Low Frequency Electrical Fields

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Abstract : Water suspensions of in-organic (metals and oxides) and organic nano-objects (chitozan and collagen) were subjected to the treatment of direct and alternative electrical fields. In addition to quasi-periodical spatial patterning resonance-like performance of spatial distributions of these suspensions has been found at low frequencies of alternating electrical field. These resonances are explained as the result of creation of equilibrium states of groups of charged nano-objects with opposite signs of charges at the interparticle distances where the forces of Coulomb attraction are compensated by the repulsion forces induced by relatively negative polarization of hydrated regions surrounding the nanoparticles with respect to pure water. The low frequencies of these resonances are explained by comparatively big distances between the particles and their big masses with t\respect to masses of atoms constituting molecules with high resonance frequencies. These new resonances open a new approach to detailed modeling and understanding of mechanisms of the influence of electrical fields on the functioning of internal organs of living organisms at the level of cells and neurons.

Keywords : bio-polymers, chitosan, collagen, nanoparticles, coulomb attraction, polarization repulsion, periodical patterning, electrical low frequency resonances, transformations
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