X International Conference

for Professionals and Young Scientists

"LOW TEMPERATURE PHYSICS"

in memory of B.Verkin for his 100th birthday

anniversary

June 3 - 7, 2019

Conference Program

&

Book of Abstracts

Kharkiv 2019

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LOW TEMPERATURE PHYSICS
ICPYS LTP 2019
in memory of B.Verkin for his 100th birthday anniversary

Organised by B. Verkin Institute for Low Temperature Physics and Engineering (ILTPE) of the NAS of Ukraine
Council of Young Scientists of B. Verkin ILTPE of NAS of Ukraine

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DIELECTRIC PROPERTIES OF NANOPARTICLE SUSPENSIONS AT LOW TEMPERATURES: A THERMODYNAMIC OF SOLUTION HYDRATION

L.V. Batyuk[1], O.M. Morozova[1], N.N. Kizilova[2]

[1]Kharkov National Medical University, 4 Nauki Ave., Kharkiv, 61022, Ukraine
e-mail: liliyabatyuk24@gmail.com
e-mail: oksanabakan2012@gmail.com
[2] Warsaw University of Technology, Pl. Politechniki 1, Poland, 00661, Warsaw
e-mail: n.kizilova@gmail.com

Modern direction of nanomedicine is creation of complex biocompatible nanomaterials that promote the targeted drug transport to the place of localization of pathological process [1]. As known, suspensions of nanoparticles (NP) to be the best candidates which possess unique structural characteristics and unusual mechanical, electrical, thermal and biological properties [2], [3]. Biological compounds of NP are suspensions groups of micoparticles like cells with the extremely high thermal conductivity of the in comparison to the base fluid. The dielectric behavior of particles can be simulated by taking into account the spherical and ellipsoidal shape dependences of the surface and volume. The purpose of the investigation is build a model that can account in a unified way for the dielectric response of NP in suspensions in the formalism of Kluitenberg's theory, and later to derive the expression of the complex dielectric function that generalizes the one of Debye. The Kluitenberg's idea consists in the assumption that there is a vector field Ω which plays the role of thermodynamic internal degree of freedom and which influences the polarization [4]. As an example were comparing the results obtained with experimental data.

Based on this model, we have analyzed the effect of temperature on the dielectric dispersion curves of red blood cells in suspension. The hydration shell of NP is heterogeneous with respect to fractional composition. The approximate values of ΔH and ΔS can be estimated based on the assumption that the two structural species of liquid water can be approximated. The temperatures changed are influence the polarization of the NP. It is conceivable that this behavior corresponds to an decrease in the relaxation time, i.e. the lower the temperature the higher the polarization process. This is normally formulated by an activation process for the relaxation time, of the type independent entities and corresponds to the Debye model. All the parameters of the model have distinct influences on the dispersion curves, a fact that lead us to conclude that all the parameters can be accurately obtained by fitting experimental data with our model.

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