8th International Conference

PHYSICS OF LIQUID MATTER: MODERN PROBLEMS

May 18-22, 2018

http://plmmp.org.ua

ABSTRACTS

Taras Shevchenko National University Of Kyiv

Bogolyubov Institute for Theoretical Physics of the National Academy of Sciences of Ukraine

Editor: Leonid A. Bulavin

Kyiv, Ukraine
2018

Pre-conference version

CONFERENCE CHAIRMAN:
Leonid A. Bulavin,

Academician of the National Academy of Sciences of Ukraine,
Taras Shevchenko National University of Kyiv
https://sites.google.com/site/leonidbulavin/
http://www.researchgate.net/profile/Leonid_Bulavin

CONFERENCE CO-CHAIRMAN:
Anatoly G. Zagorodny,

Academician of the National Academy of Sciences of Ukraine,
Bogolyubov Institute for Theoretical Physics
of the National Academy of Sciences of Ukraine

SCIENTIFIC COMMITTEE:
Anisimov M. (USA), Camp Ph. (UK), Chalyi A. (Ukraine), Ilyin V. (Israel), Kopcansky P. (Slovak Republic), Lebovka N. (Ukraine), Melnik R. (Canada), Nosovsky A. (Ukraine), Osawa E. (Japan), Pettersson L. (Sweden), Rawiso M. (France), Schröer W. (Germany), Tsukruk V. (USA), Vekas L. (Romania), Xu L. (China), Zhang F.-S. (China)

ORGANIZING COMMITTEE:
Abdikarimov B. (Kazakhstan), Atamas N. (Ukraine), Chalyi K. (Ukraine), Chudoba D. (Poland), Garamus V. (Germany), Gavryushenko D. (Ukraine), Gotsulskiy V. (Ukraine), Jumabaev A. (Uzbekistan), Kalugin O. (Ukraine), Kozlovskii M. (Ukraine), Lisetski L. (Ukraine), Odinaev S. (Tajikistan), Petrenko V. (Ukraine), Plevachuk Yu. (Ukraine), Sysoev V. (Ukraine), Timko M. (Slovak Republic), Zabashta Y. (Ukraine)

LOCAL ORGANIZING COMMITTEE
Alekseev O., Bardik V., Brytan A., Buran S., Grebnyov O., Grigoriev A., Golik Yu., Kleschonok T., Kovalchuk V., Lazarenko M., Maliarenko E., Melnik I., Nikolaienko T., Ostapchenko S., Rudnikov E., Senchurov S., Svechnikova O., Tkachev S., Verbinska G., Vergun L.

CONFERENCE SECRETARIES: Kostyantyn Cherevko, Sergiy Perepelytsya

Pre-conference version

2-5.O

FREE AND CONFINED WATER AT THE ERYTHROCYTE MEMBRANES OF HEALTHY AND INVALID INDIVIDUALS: A MICROWAVE DIELECTROMETRY STUDY

Liliya V. Batyuk[1], Natalya N. Kizilova[2*]

[1]*Department of Medical and Biological Physics and Medical Information Science, Kharkiv National Medical University, Nauki av., 4, Kharkiv, 61022, Ukraine*

[2]*Department of Applied Mathematics, Kharkov National University, Svobody sq., 4, 61022 Kharkiv, Ukraine*

* Corresponding author e-mail: n.kizilova@gmail.com

Blood is a concentrated suspension of red blood cells (RBC) and its physical properties are essential for proper circulation, oxygen delivery and nutrition of tissues. Especially its dielectric parameters are of relevance for medical diagnostics [1-3], cell separation, checking the deterioration of preserved blood, dielectric coagulometry and other medical applications. As it was shown by microwace dielectrometry (f=9.2 GHz), the real Re(ε) and imaginary Im(ε) parts of the complex dielectric permittivity ε of diluted suspensions of RBC and RBC ghosts of the blood sampled from patients with different types of cancer [2] and stroke [3] differ from those in healthy donors.

In this study Re(ε) and Im(ε) values have been measurement in the patients before and after X-ray and chemical treatment. The corresponding dependencies are presented in fig.1a,b. The differences between the healthy donors and patients are temperature dependent. After the successful treatment the dielectric properties return to the normal values. The proposed mechanism of the dielectric changes is based on the disease-specific modifications of the RBC membranes. The corresponding mathematical models are presented and discussed based on the experimental data.

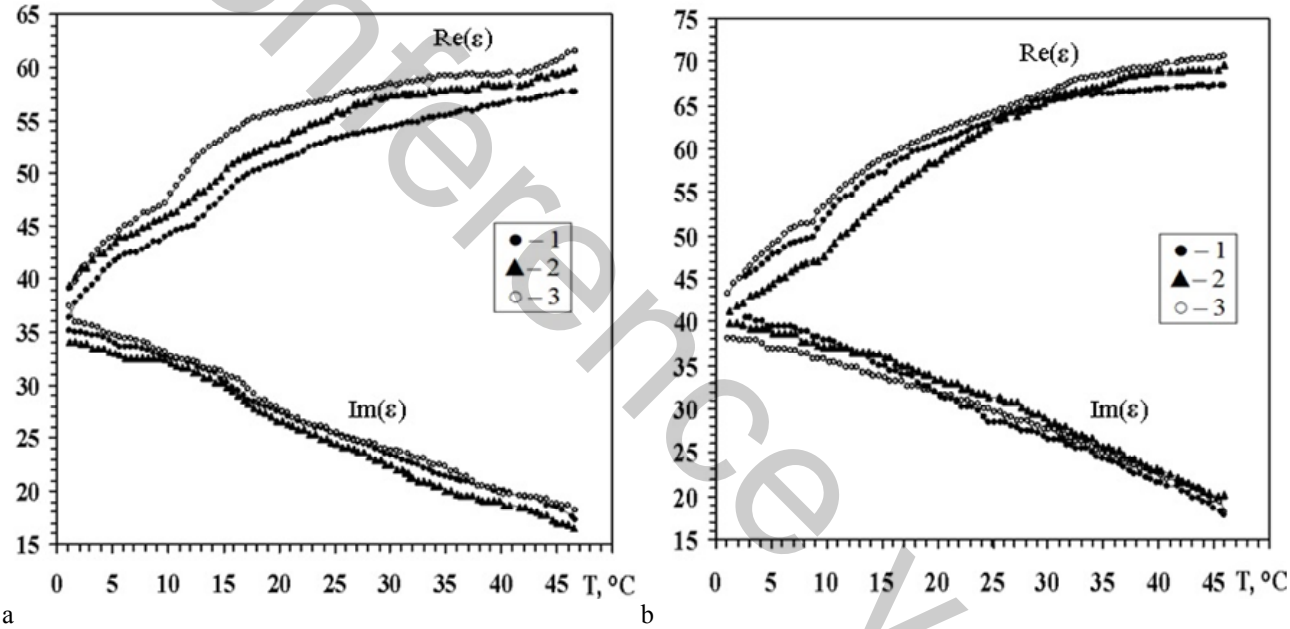

Fig.1. The dependencies Re(ε) and Im(ε) versus ambient temperature for RBC suspensions (a) and RBCe ghosts (b) measured on the control group (1) and groups of patients with breast (2) and lung cancer (3).

References

[1] Y. Hayashi, Y. Katsumoto, I. Oshige, et al., J. Non-Cryst. Solids **356**, 757–762 (2010).

[2] L. Batyuk and N. Kizilova, Book of Abstracts of the 14th Joint European Thermod. Conf., Budapest, 17-18 (2017).

[3] L. Batyuk, D. Astapovich, V. Berest and N. Kizilova, Book of Abstracts of Intern. Conf .”From molecules to functional materials”, Bialka Tatrzanska, Poland, 220-221 (2017).

Preconference version