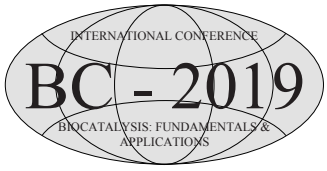
12th INTERNATIONAL CONFERENCE

BIOCATALYSIS-2019:

FUNDAMENTALS & APPLICATIONS

ABSTRACTS

June, 24-28, 2019
St. Petersburg - Valaam - Kizhi
Russian Federation



12th INTERNATIONAL CONFERENCE
BIOCATALYSIS-2019:
FUNDAMENTALS & APPLICATIONS

ORGANIZING COMMITTEE

***Chairman:* Prof. S. Varfolomeyev**
***Vice-Chairman:* Prof. I. Kurochkin**
***Scientific Secretary:* Dr. T. Osipova**

Members:

Prof. Gabibov A.
Prof. Bachurin S.
Prof. Klyachko N.
Dr. Gachok I.
Prof. Sinyashin O.
Prof. Bonch-Osmolovskaya E.
Prof. Nemukhin A.
Dr. Zaitseva E.
Prof. Popov V.
Prof. Tishkov V.
Dr. Knorre V.
Mr. Rybalov A.

PROGRAMME COMMITTEE

***Chairman:* Prof. V. Tishkov**
***Vice-Chairman:* Dr. A.Pometun**

Members:

Prof. Gabibov A.
Prof. Klyachko N.
Prof. Bonch-Osmolovskaya E.
Prof. Kurochkin I.
Prof. Ugarova N.
Prof. Švedas V.
Dr. Belogurov A.
Dr. Savin S.

Sponsored by

MAKO Congress Management
Technical secretariat

QIWI

TATNEFT

INTERNATIONAL CONFERENCE

BC - 2019

BIOCATALYSIS: FUNDAMENTALS & APPLICATIONS

12th INTERNATIONAL CONFERENCE

BIOCATALYSIS-2019:

FUNDAMENTALS & APPLICATIONS

ABSTRACTS

St.Petersburg – Valaam – Kizhi
June, 24-28, 2019

УДК 577(035.3)

Biocatalysis-2019: Abstracts of 12th International Conference “Biocatalysis: Fundamentals and Applications” / Editor V. Tishkov [Electronic resource] – Moscow:
Innovations and High Technologies MSU Ltd, 2019
– 1 electronic optical disk (CD-ROM); 12 cm.
– System requirements: Personal computer with processor 486+, Windows 95,
CD-drive; Adobe Acrobat Reader.
ISBN 978-5-9651-1245-6

Биокатализ – 2019: Тезисы 12-й Международной конференции «Биокатализ: Фундаментальные основы и применение» / Редактор В.И.Тишков
[Электронный ресурс] – М.: ООО «Иннотех МГУ», 2019.
– 1 электрон. опт. диск (CD-ROM); 12 см.
– Системные требования: ПК с процессором 486+; Windows 95; дисковод CD-ROM; Adobe Acrobat Reader.
– 250 экз. ISBN 978-5-9651-1245-6

Magnetic liposome responsive to super-low frequency alternating magnetic field

K.Yu. Vlasova[1], I.M. Le-Deygen[1], N.L. Klyachko[1,2,3], Yu.I. Golovin[1,2], A.V. Kabanov[1,3], M. Sokolsky-Papkov[3]

[1]Lomonosov Moscow State University, Moscow, Russia
[2]G.R. Derzhavin Tambov State University, Tambov, Russia
[3]University of North Carolina at Chapel Hill, Chapel Hill, U.S.A.

Keywords: magnetic liposomes, lipid composition, drug release, super-low frequency AC MF

Magnetic liposomes are developed for targeted delivery and "on demand" release of drugs. The project investigates magnetic liposomes of various compositions containing hydrophobized iron oxide magnetic nanoparticles (MNPs) in lipid membranes. Such liposomes are shown to release the entrapped dye once modulated by low frequency alternating current magnetic field (AC MF). Their exposure to the AC MF (50 Hz, 15 to 110 kA/m) results in the clustering of the MNPs in the membranes, loss of liposomal structure and disruption of the lipid packaging as determined by the transmission electron microscopy (TEM) and attenuated total reflection Fourier transfer infrared (ATR-FTIR) spectroscopy. The field induced dye release depends on the lipid composition. PEGylation of liposomes increases their stability and slightly decreases the release. Addition of cholesterol (Chol) greatly diminishes the dye release from the saturated lipid 1,2-Distearoyl-sn-glycero-3-phosphocholine (DSPC) based liposomes. Replacement of the DSPC for unsaturated lipid egg L-α-phosphatidylcholine (eggPC) also decreased the dye release. The dye release depends on the temperature as well as the strength, but not the frequency of the field (50 Hz vs 1000 Hz). The use of DC fields of similar strength does not release the solutes from the magnetic liposomes. We posit that the oscillating motion of MNPs in AC MF disrupts or ruptures the gel phase membranes of saturated lipids. As the temperature increases the likelihood of the disruption also increases. In the liquid crystalline membranes formed by unsaturated lipids or after adding Chol to saturated lipids the deformations and defects created by mechanical motion of the MNPs are more likely to heal and results in decreased release. The study provides rationale for the design of such liposomes for future drug delivery applications.

Investigation was supported by RFBR 17-54-33027 and 18-29-09154 grants.