

**Proposals for cooperation
of department of Organic Chemistry,
Biochemistry and Microbiology of NTU “KHPI”**

Department of Organic Chemistry, Biochemistry and Microbiology of NTU “KHPI”

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Research:

The design and application of new highly sensitive organic fluorescent probes, sensors and markers;

Development of spectroscopic techniques, which can be used in bio-medical research.

Methods:

Fluorescence Spectroscopy

Recent projects

New chemosensory systems and nanomaterials based on organo-silica hybrids with fixed fluorophores and electroactive substances (2014-2016).

Molecular systems with excited state proton and charge transfer as the basis for the creation of sensor materials (2010-2012).

We have proposed a set of environment-sensitive fluorescent probes (based on derivatives of 2,5-diaryl-1,3-oxazole and 1,3,4-oxadiazole), which has been used for spectroscopic visualization of:

- **the pathological changes in human platelet membranes during cerebral atherosclerosis [ref. 1].**
- **the changes of physical-chemical properties (polarity, viscosity, hydration) of human erythrocyte membranes under the influence of low molecular weight cryoprotectants [ref. 2].**
- **the changes of physical-chemical properties of human erythrocyte membranes under the influence of a magnetic field or electromagnetic radiation [ref. 3].**

Selected publications

- (1) Y. Posokhov “Fluorescent probes sensitive to changes in the cholesterol-to-phospholipids molar ratio in human platelet membranes during atherosclerosis”// *Methods and Applications in Fluorescence*. – 2016. – V. 4. – 034013. – P. 1-12
- (2) Y. Korniyenko, Y. Posokhov “Ortho-hydroxy derivatives of 2,5-diaryl-1,3-oxazole as fluorescent probes to monitor the changes in human erythrocyte membranes under the influence of low molecular weight cryoprotectants” // *Progress in Nanotechnology and Nanomaterials*. – 2014. – V. 3. – Iss. 3. – P. 32-36.
- (3) Y.O. Posokhov, V.N. Pasiuga, Y.G. Shckorbatov “Method of fluorescent probes to monitor the changes in human erythrocyte membranes under the influence of magnetic or electromagnetic fields” // *22nd Int. Crimean Conference “Microwave & Telecommunication Technology” (CriMiCo’2012)*. 10—14 September, Sevastopol, Crimea, Ukraine, 2012. – P. 956-957.

Example of usage of the fluorescent probes for the spectroscopic visualization of pathological changes in human platelet membranes during cerebral atherosclerosis

(modified from Y. Posokhov. Methods Appl. Fluoresc. 4 (2016) 034013 pp. 1-12.

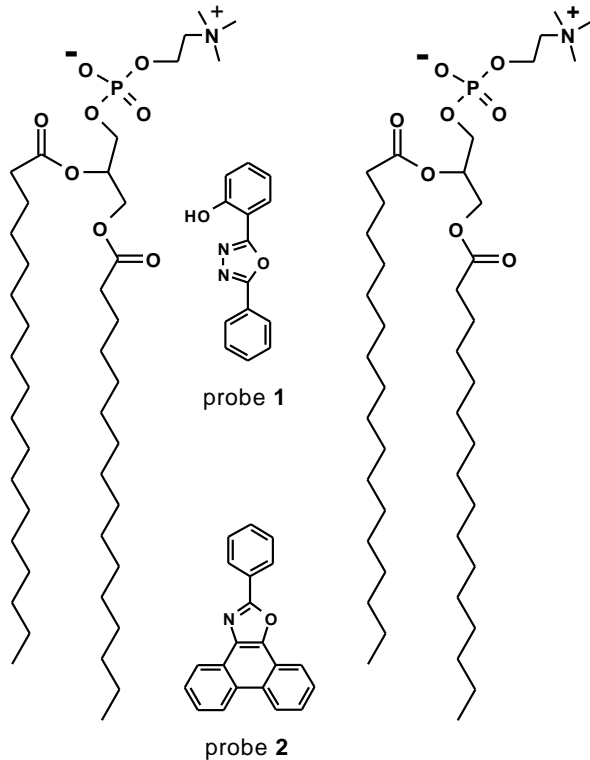


Figure 1. Expected location and orientation of fluorescent probes **1** and **2** in lipid bilayer. Two molecules of phosphatidylcholine from the outer monolayer are shown to denote the location of the probes.

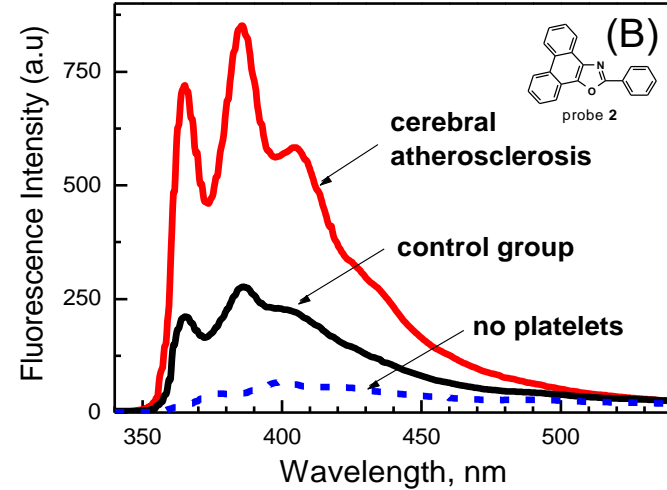
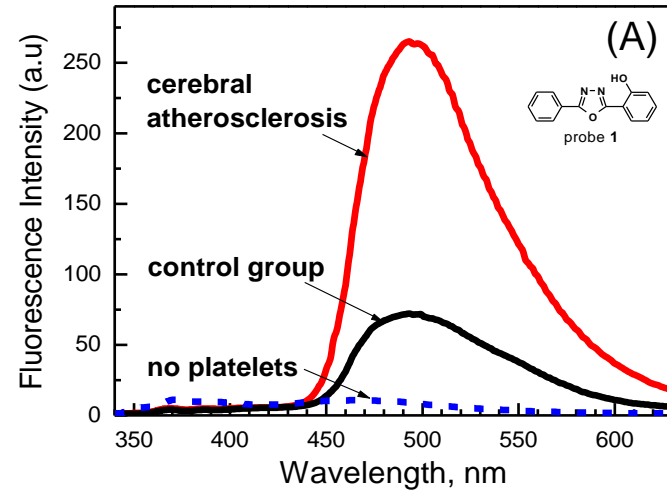


Figure 2. Fluorescence spectra of probes **1** (panel A) and **2** (panel B) were recorded for: the probes bound to platelet membranes from control group (healthy volunteers (age: 18-35 years old)) – black solid line; the probes bound to platelet membranes from the patients with cerebral atherosclerosis (age: 60-74 years old) – red solid line; the probes in phosphate buffer with no platelets – blue dashed line.

Proposals for the cooperation

- **Goal:**

Using highly sensitive fluorescent probes to develop new fluorescence techniques for spectroscopic visualization of pathology changes in various cell membranes during different diseases.

- **Expected result:**

New fluorescence techniques for spectroscopic visualization of pathology changes in cell membranes

- **Areas of potential applications of the expected result:**

bio-medical research, medical diagnostics (clinical analysis).