Poster

Investigation of nanostructured films of antibodies and polymers.

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Enzyme-linked immunosorbent assay (ELISA) is widely used for a great number of analytical problems in the medical diagnostics and the quality control of foods and environment. Now ELISA technique continues to develop for constructing more sensitive, miniaturized, reliable, and less time consuming immunoassay devices and also for creating more simple and cheap automatic technologies for their manufacture.

Antibodies immobilization is an essential part of any ELISA construction. In the present study the method of antibodies immobilization via formation of nanostructured films with polymers was developed and the properties of these films were investigated. This method is much more simple, cheap and less time consuming than the covalent modification method and suitable for a wide range of surfaces. To form nanostructured films we used monoclonal mouse antibodies which were adsorbed from a solution onto the investigated surface modified with polymer nanofilms. The polymer nanofilms were obtained in the same way – via adsorbing from the solution.

The properties of nanostructured polymer and antibodies films obtained on the surface of highly oriented pirolytic graphite (HOPG) were studied. With the help of ELISA method we also investigated correlation between antibodies activity and the polymer used for film formation. Structure and stability of the films were studied using Scanning Force Microscopy (SFM).

Our investigations show that the activity of antibodies depends on the kind of polymer used in the nanostructured film. The highest activity was obtained for two polymers: poly(2-acrylamido-2-ethylpropansulfonic acid) (PAMPS) and poly(diethylaminophosphozen) (PPh) [1]. The films with other polymers were less active or gave the high level of background non-specific signal.

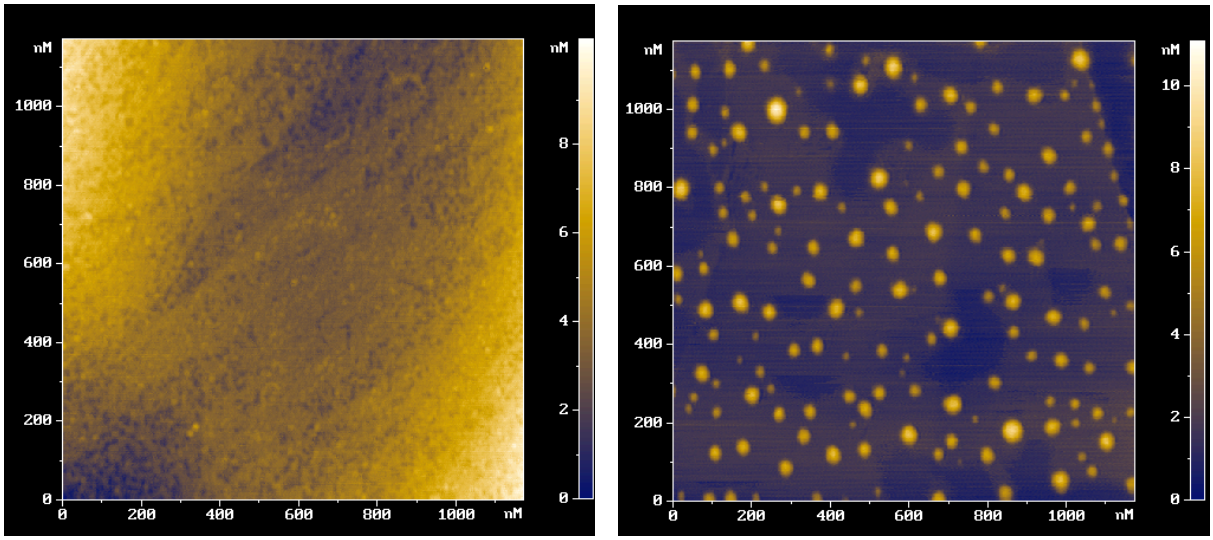
SFM images showed that initially we obtained regular films which thickness is about several nanometers (see fig.). The most stable films were obtained with PPh, while using of the other polymers leads to easy deformation of the films. Obtained structure of the films explains low activity of the antibodies for some polymers - when deformation of antibodies occurs. In the case of high background nonspecific signal we could see the rearrangement in the film structure on SFM image [2].

It was also shown that the method developed allows antibodies immobilization on different surfaces but the influence of the surface should be studied individually for every used material.

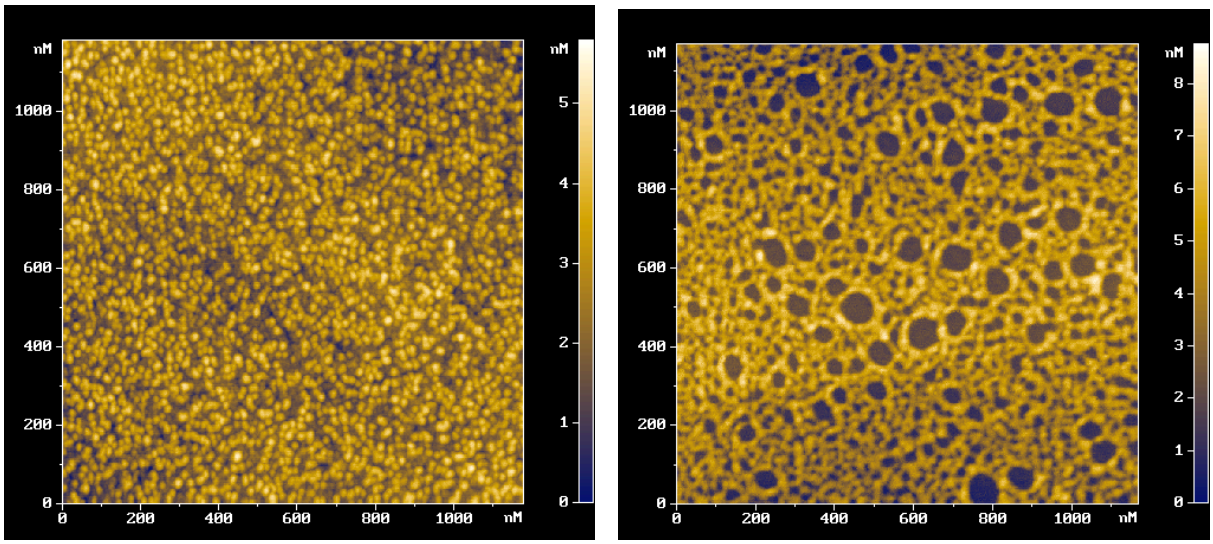
References:

[1] V.S. Papkov , M.N. Il'ina, etc, Macromolec., Volume 25, No 7 (1992), pp. 2033-2040.
[2] E.G. Evtushenko, I.N. Kurochkin, E.A. Dontsova, etc, J. Rus. Nanotechnology, Volume 2, No 1-2 (February 2007), pp. 145-153.

Figures:



a b



c d

SFM images of nanofilms: a) PPh on HOPG surface; b) poly((dimethyldiallylammonium) chloride) (PDDA) on HOPG surface; c) antibodies on PPh film (HOPG); d) antibodies on PDDA film (HOPG).