

Nanochemistry and biotechnology

Development of genosensor based on LSPR for detection of DNA sequences related to Ph'-leukemia.

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Sequence-specific hybridization between single-stranded oligonucleotides immobilized on a sensor surface and fragments of nucleic acids of the investigated samples is a straightforward way for identification of various genetic and infectious diseases. For example, some leukemia can be associated with the so-called Philadelphia chromosome (Ph'-chromosome), which is a result of the reciprocal translocation between human chromosomes 9 and 22. The translocation causes formation of a hybrid *bcr-abl* gene and corresponding protein Bcr-Abl, which participates in the pathological process [1].

Our previous work showed the successful application of the oligonucleotide probe mod-Ph, for preparation of bioselective element of the SPR biosensor [2]. This probe sequence is complementary to region of the hybrid messenger RNA (mRNA), which contains exon 14 of the *bcr* gene and exon 2 of the *abl* gene.

The aim of present work was to develop genosensor based on the LSPR device *Nanoplasmon-03* designed by V.E. Lashkaryov Institute of Semiconductor Physics. It opens the possibility to improve the operation parameters comparing with SPR biosensor, as the effective EM-field-decay length of LSPR is 40–50 times shorter than that of SPR [3]. In addition, a selection of the appropriate way of fabrication of the biosensor chip was made, that resulted in ten-fold increase of the signal to noise ratio.

1. Telegeev GD, Dubrovska AN, Dybkov MV, Maliuta SS (2004) Influence of BCR/ ABL fusion proteins on the course of Ph leukemias. *Acta Biochim Pol* 51:845–9
2. Rachkov A, Holodova Y, Ushenin Y et al. (2009) Development of bioselective element of SPR spectrometer for monitoring of oligonucleotide interactions and comparison with thermodynamic calculations. *Sens Lett* 7:957–961
3. Willets KA, Van Duyne RP (2007) Localized surface plasmon resonance spectroscopy and sensing. *Annu Rev Phys Chem* 58:267–97