Toetab TÜ ja TTÜ doktorikool
"Funktsionaalsed materjalid ja tehnoloogiad" (FMTDK)

ESF projekt 1.2.0401.09-0079

A NOVEL BIOSENSING DEVICE BASED ON MODIFIED QUARTZ TUNING FORK RESONATOR

Sergei Vlassov[1], Ott Scheler[2], Marko Plaado[1], Rünno Lõhmus[1], Kristjan Saal[1] and Ants Kurg[2]

[1]Institute of Physics, University of Tartu, Estonia, [2]University of Tartu, IMCB, Department of Biotechnology/Estonian Biocentre

e-mail: vlassovs@ut.ee

A novel approach in creating potential biosensing device for measurements in any kind of liquid and gaseous environments is described. It comprises quartz tuning fork (QTF) resonator acting as an actuator whilst sensing element is made of carbon nanotube fiber (CNTF) having high surface area due to nanoporous structure. Sensor was made by gluing CNTF to one prong of the QTF. For measurements in liquid media only the sensing element was dipped into the liquid and QTF was held in air. Such approach enables measurements in liquids with high dielectric permeability, which is impossible with conventional QTF sensors. High surface area of the fiber assures good sensitivity. Performance capability of the novel method was confirmed experimentally by investigating the adsorption kinetics of bovine serum albumin (BSA) on CNTF surface in aqueous environment at different pH. It is known [1] that BSA adsorption rate on CNTs strongly depends on pH having the highest rate at pH4.8 and the lowest at pH7. It was shown that in accordance with predictions the frequency shift at pH4.8 was several times bigger than at pH7.

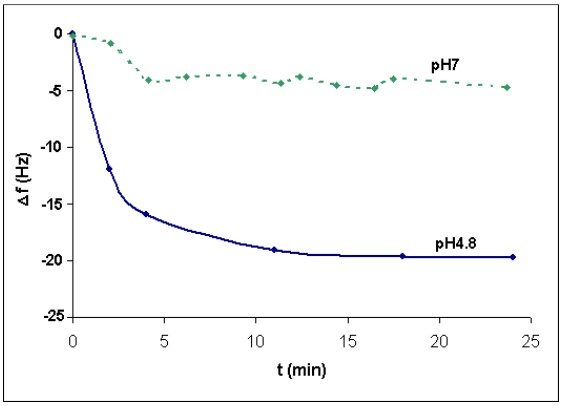

Fig. 1. The frequency shift of the modified QTF sensor system caused by the BSA adsorption onto the carbon nanotubes at pH4.8 (solid line) and pH7 (dotted line)

References

1. L.E. Valenti, P.A. Fiorito, C.D. García and C.E. Giacomelli, 2007, vol. 307, no2, pp. 349-356