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About Field- and Affinity Interactions of Piezoelectric GaPO4 (BAW) and ZnO Thin Film Transducers

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Abstract -The paper is focused to the formation of immunocomplex ASC at the surface of the GaPO4 and AT-cut quartz resonator vibrating in thickness-shear mode, which is subjected by external magnetic field. In the former case, the biochemical affinity process can be characterized by the binding between a covalently immobilized small molecule and its relative antibodies. The binding curves of series resonance frequency f_s vs. time t were measured and discussed. In the latter case, the mobility of the ferromagnetic particles in liquid was studied. Recent laboratory works are focused also to the thin ZnO films, deposited on the Si-substrate.

The biological sensors based on the bulk acoustic waves (BAW) resonators are characterized by analytic-selective coatings and the dynamic frequency response, measured by the zero-phase method. The resonance frequency changes report on the properties of the analytic coating [1-3]. Selected modes of vibrations and external field can affect the mobility of nanoparticles.

We analyzed the binding between a covalently immobilized small molecule and its relative antibodies. Formation of immunocomplex AB at the surface of the quartz- and GaPO4 resonator vibrating in thickness-shear mode was studied. The binding curves of series resonance frequency f_s vs. time t of the immunosensor were measured (see Fig.1) and discussed. The reactions times depend on the concentration of antibody and analyte.

Now, introducing the ferro-nanoparticles, the magnetic field was applied and the mobility of nanoparticles was observed. The basic properties of the ZnO thin films are investigated by laser interferometry [4].

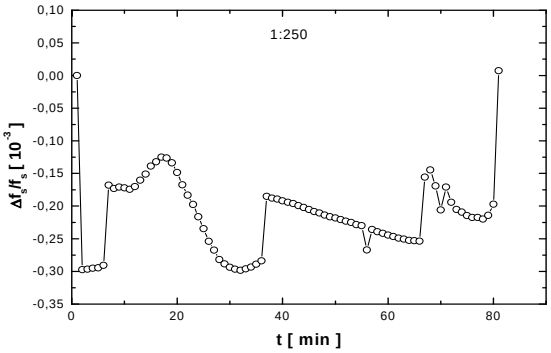

Fig. 1: Affinity reaction of the AT-cut quartz based biosensor with the antibody ASC 1:250.

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