The development of immune biosensors based on TiO_2 photoluminescence nanostructures

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Immune TiO_2-based biosensors for the detection of *Bovine leucosis* and *Salmonella spp.* viruses have been developed. The TiO_2 substrates, used as a biosensor platform, were deposited from colloidal suspension of TiO_2 nanostructures solved in water. Structural and surface properties showed that obtained substrates formed high surface area porous structure that is suitable for immobilization of biological species. The photoluminescence (PL) from TiO_2 nanostructures (anatase modification) was used as a signal of biosensor response. PL spectra of TiO_2 nanostructures were excited by solid state laser with λ_{ex} = 355 nm and were measured in the range of 370-800 nm. The sensitive layer was formed by immobilization of biorecognition layer (antibodies of *Salmonella spp.* and antigens in the case of *Bovine leucosis*) on TiO_2 surface.

The photoluminescence spectrum of pure TiO_2 nanostructures characterized by broad peak centered at 510 nm. In both cases, the immobilization of sensitive layer on TiO_2 surface led to the increase of PL intensity and UV-shift of PL maximum. Interaction with analyte molecules resulted in the decrease of PL intensity and shift of peak position to higher wavelengths. Thus, the biosensor response can be a function of two parameters: PL intensity and position of PL peak. Interaction mechanisms between proteins and TiO_2 nanostructures are proposed. The sensitivity of biosensor, based on TiO_2 nanowires, was in the range of 10^2 – 10^6 cl/ml for *Salmonella spp.* antigens [1].

Similar methodology was used to detect *Bovine leucosis* antibodies using biosensor, based on TiO_2 photoluminescence nanoparticles [2].

References

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