Enhancement of the sensitivity of Surface Plasmon Resonance sensor for protein detection

Erenildo F.Macedo, Dayane B. Tada*

[1]Laboratory of Nanomaterials, Department of Science and Technology, Federal University of São Paulo, São José dos Campos, Brasil.

ere_macedo@yahoo.com.br

This study describes the development of a method to increase the sensitivity of a biosensor useful in the technique of Surface Plasmon Resonance (SPR) for protein detection. In order to evaluate the enhancement of the sensitivity, a sensor for lectin detection was used as a model. In this model, antibodies anti-Arachis hypogae and anti-Concanavalin A were immobilized on the surface of the biochip. Firstly, the biochip was validated by the analysis of the interaction between the immobilized antibodies and the lectins in solution. As expected, the reflectivity signal increased proportionally with the increase of the lectin concentration and each antibody spot was correctly recognized by its respective lectin. Then, samples of Arachis hypogae and Concanavalin A at very low concentration (90-380nM) were mixed with gold nanoparticles (NPs) suspension functionalized with mercaptoundecanoic acid. In the next step, it was analysed the interaction between antibodies immobilized on the biochip and lectins linked to the gold NPs. For both types of lectin, it was observed higher sensitivity for lectin-functionalized NPs compared to lectin free in solution. The reflectivity signal for NPs functionalized with lectin was about 15-fold higher than the signal observed for the solution of lectin. Furthermore, the biosensor saturation for functionalized NPs occurred at higher lectin concentrations. These results showed that this is a promissory method to be applied in the analysis of proteins at very low concentration and for this reason it would be very useful in the diagnosis of several diseases including ovarian cancer, that was our motivation for the development of this work. Future research will include the use of the method presented here for the detection of ovarian cancer biomarkers.