TITLE SENSOR CHIP DESIGN FOR BIOMOLECULAR DETECTIONS USING SURFACE PLASMON RESONANCE BIOSENSOR AND A POSSIBLE APPLICATION IN PROTEINS OF NATURAL RUBBER LATEX

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ABSTRACT This research is intended to study an interesting topic divided into two main parts; (1) the design and characterization of a surface plasmon resonance biosensor chip for biomolecular detection and (2) characterization of associated proteins and phospholipids in natural rubber latex. Surface plasmon resonance (SPR) technique is sensitive to the changes in the refractive index of dielectric added layers in real time that are unlabeled. Therefore, by determining the best SPR performance for different applications, the SPR chip surface feature can be optimized to suit each biomolecular size in diagnostic detection. A novel design for bimodal carboxylic dextran sensor chips was prepared to possess two distinct layers of end-grafted dextran brushes in which the free ends of short chains are found in the inner layer to prevent non-specific binding and the free ends of long chains are found in the outer layer of the brushes. Reactive carboxylic groups were subsequently generated only on the long dextran chains for ligand immobilization. The grafting long chain dextran density was controlled by varying its solution concentration. The success of each modification step was characterized by proton nuclear magnetic resonance spectroscopy (1H-NMR), Toluidine-blue O test and contact angle measurements. The SPR system was used to detect the biomolecular recognition binding of three biological substances with different sizes in order to evaluate the efficiency of the prepared sensing surface. It was found that the densely packed dextran surface is suitable for the detection of small biomolecules like mouse IgG and ferritin, while the surface with low dextran density performs better for large size analytic substances like the WSSV virus. In another study, it was presumed that phospholipid-protein layers covering the natural rubber (NR) particle surface are especially interesting due to their ability to enhance the colloidal stability of NR latex. Proteins from NR cream fraction were proteolytically removed and analyzed using SDS-PAGE, while phospholipids were removed by saponification reaction and characterized using 1H-NMR spectroscopy. The colloidal behavior of NR latices before and after removal of the protein-lipid membrane was evaluated by zeta potential analysis and scanning electron

microscope (SEM). A gray ring near the NR particle surface corresponding to the protein-lipid membrane layer could be clearly observed on SEM micrographs