様式８

論　文　内　容　要　旨

報告番号	甲　先　第　251　号	氏　名	李 江
学位論文題目	Development of low-invasive biosensor for in vivo glucose monitoring (低侵襲型体内グルコースモニタリング用バイオセンサの開発)		

内容要旨

Diabetes mellitus is a major worldwide public health concern. It is widely agreed that strict control of blood glucose, focusing on maintenance of glucose levels as close to normal as possible, is important for diabetics to avoid long-term complications of hyperglycemia, which is responsible for heart disease, kidney failure, or vision loss, as well as acute adverse events related to hypoglycemia, such as seizures, coma, and even death. Therefore, in order to get effective treatment, the management of diabetes mellitus for diabetics requires an intensive monitoring of blood glucose levels. When compared to traditional self-monitoring of blood glucose (SMBG) alone, use of continuous glucose monitoring system (CGMS) has been shown to improve the control of blood glucose. Most of the commercialized or presented conventional CGMS requires the device inserted about 1.0 cm in length inside the skin. In the present study, we are trying to develop lower invasive CGMS for the improvement of diabetic patients' quality of life. In this research, a low invasive type glucose sensor, which has a sensing region at the tip, was developed for continuous glucose monitoring. *In vitro* evaluation of the proposed sensor was described. The fabricated sensor showed a stable and linear response at various glucose concentrations. It also exhibited a good long term stability and the influence of interfering compounds existing in biological fluid to sensor response were sufficiently low. Then, *in vivo* evaluation of the proposed sensor was demonstrated. The proposed sensor, which requires no more than 1 mm in length to be inserted in skin, provided similar sensor response behavior with that of model sensor. The response of proposed sensor was also correlative with the trend of blood glucose level. The proposed sensor has a good promise for practical use as a low-invasive type biosensor for continuous glucose monitoring. Subsequently, sensitivity improvement of the sensor was focused on. The surface area of the sensing region was attempted to increase by electroetching for the enhanced sensitivity. The sensitivity to hydrogen peroxide was confirmed to be increased nearly 3 times by electroetching, while the sensitivity to glucose response was relatively lower than that we have expected. The next attempt to increase the sensitivity, that is, glucose oxidase was immobilized with carbon nanotube using chitosan nanofiber as a binder at the sensing area of the electrode. *In vitro* evaluation of the proposed sensor was successfully demonstrated. A good response current for glucose was obtained by the electrode and it was twice higher than the previous designed electrode.