Development Of A Stick-Type Bioelectronic Sniffer For Device Ethanol Vapor

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Ethanol concentration in breath is widely used as an index of blood ethanol concentration. In this paper, a bioelectronic sniffer (bio-sniffer) device [1]-[3] for alcohol vapor that was constructed on filter paper, were fabricated with using alcohol oxidase (AOD).

Fig. 1 shows the structure of the stick-type bioelectronic sniffer for alcohol vapor. With the structure shown in Fig. 1, a stick type bio-sniffer for alcohol was fabricated with using a filter paper as the substrate of the electrodes. Carbon and Ag/AgCl electrodes were formed by printing their paste (carbon paste: Electrodag505SS, LOT.0029; Ag/AgCl paste: Electrodag6037SS, LOT.0015, Acheson Japan Co., Ltd., Kobe, Japan) onto each side of a filter membrane (No.2, thickness:0.25mm, ADVANTEC TOYO Co., Ltd., Tokyo, Japan), respectively. This sensor was based on the enzyme reaction of AOD that is shown in the chemical reaction equation (1). In the presence of molecular oxygen, ethanol is oxidized by the enzyme AOD to acetaldehyde and hydrogen peroxide. Then, this sensor detects hydrogen peroxide produced by the reaction.

$$RCH_2OH + O_2 \xrightarrow{AOD} RCHO + H_2O_2 \qquad (1)$$

The fabricated bio-sniffer was evaluated with a computer-controlled potentiostat (Potentiostat, Model 1112, BAS Inc., Tokyo, Japan) at a potential of 900 mV vs. Ag/AgCl. As the results, the sniffer current increased rapidly following addition of standard ethanol vapor to give a steady state output which related to the applied ethanol concentration. The response time to reach 90% of the steady current after applying ethanol vapor was approx. 40 sec. The calibration curve of the sniffer for ethanol in the gas phase is related to the concentration of ethanol in the gas phase over the range 1.0 to 500 ppm.

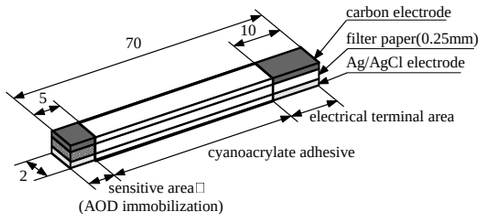

Fig.1. Structure of a bioelectronic sniffer for alcohol vapor.

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