

Odourless Watermark (Digital Chemocode) System with Biochemical Sniff Scanner

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Many types of identification systems such as watermark, barcode, integrated circuit (IC) tag, and fingerprint systems have been developed and utilized. These identification systems recognize physical information of the identification medium for certification information. However, an identification system that detects the chemical characteristics of a subject is not yet practicable. In this study, an odourless and invisible watermark system was developed using biochemical gas sensors (biosniffers) for detecting encoded chemical information. Each biosniffer consisted of a Clark-type dissolved oxygen electrode and an enzyme-immobilized membrane. Each enzyme (catalase, lactate oxidase, or choline oxidase) was immobilized onto a dialysis membrane by photo-crosslinking with polyvinyl alcohol containing stilbazolium groups. The calibration ranges of the biosniffers for hydrogen peroxide, lactic acid, and choline vapours were from 0.4 to 12.5, 0.01 to 10.0, and 1.0 to 1000 ppm and the correlation coefficients were 0.996, 0.975, and 0.956, respectively. Each biosniffer showed a linear response to the concentration of the substrate in the gas phase. These biosniffers were used for scanning 3 bits (eight patterns) of the digital chemocode made of hydrogen peroxide, lactic acid, and choline solutions on filter paper. The three types of biosniffer successfully recognized eight patterns of odourless chemical codes.

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