Development of Odorant Sensor Using SAW Resonator Oscillator Incorporating Odorant-Sensitive LB Films and Neural-Network Pattern Recognition Scheme

Sang-Mok Chang, Hiroshi Muramatsu[1] and Isao Karube[2]

Department of Chemical Engineering, College of Engineering,
Dong-A University, 840, Hadan-dong, Saha-gu, Pusan 640-714, Korea
[1]Applied Research Department, Seiko Instruments Inc.,
Takatsukashinden, Matsudo-shi, Chiba 271, Japan
[2]Research Center for Advanced Science and Technology,
University of Tokyo, Komaba, Meguro-ku, Tokyo 153, Japan

A surface acoustic wave (SAW) sensor for the detection of odorants has been constructed by depositing various phospholipids and fatty acids onto the surface of the SAW device. Applying the Langmuir-Blodgett technique, it was possible to deposit the optimal number of layers which was found to be between 10 and 20. The characteristics of a SAW device operating at 310 MHz deposited with phosphatidyl choline were analyzed. An explanation is given for different odorant affinities based on the monolayer properties of phospholipids. The identification of odorants depending on the type of lipid used for coating is discussed in terms of a comparison of their normalized resonant frequency shift patterns. Using a number of different lipid-coated SAW devices, odorants could be identified by neural-network pattern recognition with a backpropagation algorithm.

1.   Introduction

Since Sauerbrey[1] first developed the empirical equation for the relationship between the frequency shift of a quartz resonator and the mass of a substance deposited on its