

Responses of Polymer-Coated Piezoelectric Crystals to Organic Vapors

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Quartz oscillators coated with different polymers were applied to the detection of common volatile organic solvents in a gas phase. The plot of sensor response against solubility parameter (δ) of the analyte gave a peak at δ of the polymer film. However, an oscillator coated with poly(vinyl alcohol) film did not respond in such a manner because of intermolecular hydrogen bonding with polar vapors. This sensor system enabled the rough identification of organic vapors by means of pattern recognition.

1. Introduction

Since King demonstrated that a piezoelectric quartz oscillator functions as a highly sensitive chemical sensor,⁽¹⁾ a number of researchers have studied piezoelectric gas sensors coated with thin organic films. Schierbaum and co-workers examined sensors coated with polysiloxanes and calixarenes to monitor organic gases in air.^(2,3) Turnham *et al.* applied a crystal coated with poly[bis(cyanoallyl)siloxane] (OV-275) to the detection of propylene glycol dinitrate (a toxic gas).⁽⁴⁾ Okahata *et al.* utilized a durable synthetic lipid film on a crystal as a synthetic chemoreceptive film to detect odorous substances.⁽⁵⁾ As another example of sensing lipid films, Nakamoto *et al.* constructed an odor-sensing system with eight quartz oscillators coated with naturally occurring and synthetic lipids, which could distinguish five types of whisky by neural-network pattern recognition.⁽⁶⁾ In interesting research in immunology, Ngeh-Ngwainbi *et al.* reported that a piezoelectric crystal immobilizing an antibody against parathion (a pesticide) functioned as a parathion-