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Miniaturized Polymer Coated Film Bulk Acoustic Wave Resonator Sensor Array for Quantitative Gas Chromatographic Analysis

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Abstract

This paper reports a novel miniaturized detector for gas chromatography based on film bulk acoustic resonator (FBAR) sensor array. Polymer coated FBAR demonstrated detection limit of parts per million (ppm) concentrations for several volatile organic vapors. Orthogonal selectivity between n-pentane and acetone is achieved by integrating different polymer coated FBARs as sensor array. A prototype of chromatographic instrument using FBAR sensor array as detector was demonstrated by facile hyphenation of the device with commercial separation column. Such GC system is used to quantitative identification of dual gas mixture by employing Principal Component Analysis (PCA). This MEMS chemical sensor technology offers high sensing performance, miniaturized size, and low power consumption, which are critical for development of portable gas chromatography.

Keywords: gas chromatography; film bulk acoustic resonator array; principal component analysis; volatile organic vapors

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