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Improvement of On-Site Microfluidic Benzene, Toluene, Xylene (BTX) Gas Sensor Loaded with Nanostructured Mesoporous Silicate

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We have developed a gas sensing microfluidic device for the detection and identification of aromatic volatile organic compound (VOC) gases, namely, benzene, toluene, and xylenes (BTX), which are air pollutants. We combined a nanostructured material, mesoporous silicate, as a gas concentrator and separator, and carried out spectroscopic measurement with a microfluidic device for gas identification and quantitative detection. Our method is completely different from conventional methods such as gas chromatography (GC)/mass spectrometry(MS) and provides a portable, highly sensitive and selective gas monitoring system. In this paper, we report an improvement in the performance of our BTX gas sensor that we realized by optimizing the operating conditions and by using the properties of mesoporous silicate with uniform nanosized pores. We also successfully measured mixture BTX gases separately with this device. We were able to realise better BTX separation with mesoporous silicate than with random-structured silicates. We successfully analyzed the principle behind the improvement in the gas separation owing to the characteristics of the nanosized pores of mesoporous silicate by positron annihilation spectroscopy.

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