

Characteristics of a Simple Monitoring System for Trichloroethylene Using a Hybrid Quartz Crystal Microbalance

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(Received February 7, 2008; accepted May 8, 2008)

Key words: trichloroethylene, volatile organic compounds, oxidizing agents, quartz crystal microbalance, hybrid, gas sensor

A simple and highly sensitive monitoring system for the detection of trichloroethylene (TCE) using a hybrid quartz crystal microbalance (hybrid QCM) is described. This hybrid QCM system uses lead dioxide and sulfuric acid as oxidizing agents to convert TCE into hydrogen chloride, which in turn reacts directly with a copper electrode on the quartz crystal surface. The results of experiments indicate that the sensitivity increases at higher temperatures. In addition, an increase in the amount of oxidizing agent used does not necessarily lead to a larger frequency shift, although the frequency shift does depend on the TCE concentration. Using a calibration curve, it is possible to obtain the TCE gas concentration. In the case of 100 ppb TCE, a frequency shift of 27 Hz is obtained using a 12 MHz QCM. This new detection system allows for measurement of very low concentrations of TCE and has a detection limit comparable to the Japanese environmental standard (0.2 mg/m³).

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