MICROFABRICATED ELECTROCHEMICAL SENSOR FOR GAS PHASE ANALYTES

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The objective of this paper is to report the development of a new MEMS based gas sensor for toxic chemicals. The sensor utilizes a micro-scale gas-liquid interface to create a multiphase microreactor for selective vapor detection. Currently the existing sensors for phosphonate detection are either non- selective, not highly sensitive, or non-portable. On the other hand, a MEMS based multiphase micro-reactor can bridge the gap between traditional vapor detection methods and selective analytical chemistry to create a phosphate sensor that is highly selective, highly sensitive, and highly portable.

In this paper we will present the design and optimization of a new MEMS based multiphase microreactor using experimental data and simulation results. The microreactor can detect parts-per-billion level of phosphonate vapor and by utilizing a nanoporous membrane, specific liquid chemistry can be used to selectively detect phosphonate vapor.

We created a multi-phase microchemical reactor that implements a micro-scale gas-liquid interface, using a dual microchannel/membrane design. For the membrane, either 1) nanoporous membrane or 2) microfabricated silicon pore is utilized. The membrane is sandwiched between the liquid microchannel and the gas microchannel. A thin layer of electrode material is coated on the membrane or inside the microchannel so that electrochemical responses can be measured from the electrode.