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Surface Coatings for Gas Detection via Porous Silicon SERDAR OZDEMIR, School of Physics, Georgia Institute of Technology, JI-GUANG LI, Nano Ceramics Center, National Institute for Materials Science, Japan, JAMES GOLE, School of Physics, Georgia Institute of Technology — Nanopore covered microporous silicon interfaces have been formed via an electrochemical etch for gas sensor applications. Rapid reversible and sensitive gas sensors have been fabricated. The fabricated porous silicon (PS) gas sensors display the advantages of operation at room temperature as well as at a single, readily accessible temperature with an insensitivity to temperature drift; operation in a heat-sunk configuration, ease of coating with gas-selective materials; low cost of fabrication and operation, and the ability to rapidly assess false positives by operating the sensor in a pulsed mode. The PS surface has been modified with unique coatings on the basis of a general theory in order to achieve maximum sensitivity and selectivity. Sensing of NH_3, NO_x and PH_3 at or below the ppm level have been observed. A typical PS nanostructure coated microstructured hybrid configuration when coated with tin oxide (NO_x, CO) and gold nanostructures (NH_3) provides a greatly increased sensitivity to the indicated gases. Al_2O_3 coating of the porous silicon using atomic layer deposition and its effect on PH_3 sensing has been investigated. 20-100 nm TiO_2 nanoparticles have been produced using sol-gel methods to coat PS surfaces and the effects on the selectivity and the sensitivity have been studied.

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