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Using Temperature-Dependent Phenomena at Oxide Surfaces for Species Recognition in Chemical Sensing. STEVE SEMANCIK, DOUGLAS MEIER, JON EVJU, KURT BENKSTEIN, ZVI BOGER, CHIP MONTGOMERY, Chemical Science and Technology Laboratory, NIST — Nanostructured films of SnO_2 and TiO_2 have been deposited on elements in MEMS arrays to fabricate solid state conductometric gas microsensors. The multilevel platforms within an array, called microhotplates, are individually addressable for localized temperature control and measurement of sensing film electrical conductance. Temperature variations of the microhotplates are employed in thermally-activated CVD oxide film growth, and for rapid temperature-programmed operation of the microsensors. Analytical information on environmental gas phase composition is produced temporally as purposeful thermal fluctuations provide energetic and kinetic control of surface reaction and adsorption/desorption phenomena. Resulting modulations of oxide adsorbate populations cause changing charge transfer behavior and measurable conductance responses. Rich data streams from different sensing films in the arrays have been analyzed by Artificial Neural Networks (ANN) to successfully recognize low concentration species in mixed gases. We illustrate capabilities of the approach and technology in the homeland security area, where dangerous chemicals (TICs, CWSs and CWAs) have been detected at 10-100 ppb levels in interference-spiked air backgrounds.

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