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Review Article

Optimized Feature Extraction for Temperature-Modulated Gas Sensors

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Abstract

One of the most serious limitations to the practical utilization of solid-state gas sensors is the drift of their signal. Even if drift is rooted in the chemical and physical processes occurring in the sensor, improved signal processing is generally considered as a methodology to increase sensors stability. Several studies evidenced the augmented stability of time variable signals elicited by the modulation of either the gas concentration or the operating temperature. Furthermore, when time-variable signals are used, the extraction of features can be accomplished in shorter time with respect to the time necessary to calculate the usual features defined in steady-state conditions. In this paper, we discuss the stability properties of distinct dynamic features using an array of metal oxide semiconductors gas sensors whose working temperature is modulated with optimized multisinusoidal signals. Experiments were aimed at measuring the dispersion of sensors features in repeated sequences of a limited number of experimental conditions. Results evidenced that the features extracted during the temperature modulation reduce the multidimensional data dispersion among repeated measurements. In particular, the Energy Signal Vector provided an almost constant classification rate along the time with respect to the temperature modulation.