Mathematical Model of Semiconductor Gas Sensor

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The objective of this study is to simulate physical adsorption on the surface of semiconductor sensors and to develop a method of analyzing qualitatively and quantitatively the chemical species reacting on the surface of semiconductor sensors. In ordinary studies of the detection of gas species by semiconductor sensors, researchers attach importance to the chemical sensitivity of sensors and note the output of sensors in the stationary state in terms of response characteristics. However, the response in the transient state, the region between the beginning of adsorption and the achievement of equilibrium, contains much information about processes of gases adsorbing on the surface of sensors. In this study, we discuss the relationship between the response of a semiconductor sensor and the amount of physically adsorbed gas and construct mathematical models of adsorption on the surface of the sensor. We simulate the signal of a model sensor using an autoregressive model in which the exponential behavior is extracted from the response, and show that gases can be identified and their concentrations can be determined.

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