

Mathematical modeling for SnO₂ gas sensor based on second-order response

ABSTRACT

Sensors, work on the entrance gate for exploring dynamic environments and system response. The sensor behavior plays an important role in system modeling. Therefore, finding the mathematical model, which can describe the sensor response with maximum information over time in different environments and situations, is necessary. This paper, attempts to model the optimal transfer function of the SnO₂ type gas sensor (TGS 813) for transient response and steady-state zones, based on the acquired data of the sensor. The model could be used to obtain the mathematical equation for the response, as a transfer function based on different concentrations, for the specific temperature and humidity. The data analysis has been done with Matlab software, and Genetic algorithm is further used to optimize the transfer function parameters. Moreover, the effect of variation in concentration on the transfer function coefficients has been explored. The results show that the modeling can be helpful for sensor response behavior simulation as well as physical and chemical reaction investigation.

Keyword: Gas sensor; TGS 813; Transfer function model; Transient estimation; Genetic algorithm (GA); Second-order response