A study on the sensing properties of SnO_2-based thick-film gas sensors for the chemical agent simulants

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A semiconductor gas sensor based on SnO_2 was studied at a low concentration range of chemical agent simulants such as acetonitrile, DMMP, DPM and dichloromethane from 0.02ppm to 0.8ppm at 350℃. The sensing properties of SnO_2-based gas sensors such as sensitivity, response, recovery and reproducibility were investigated by using a flow measuring system. For acetonitrile and dichloromethane, P-SnO_2 sensor prepared by precipitated SnO_2 powder with small particle size and high surface area was more sensitive than C-SnO_2 sensor prepared by commercial SnO_2 powder with large particle size. While, in the cases of DMMP and DPM, the sensitivities of C-SnO_2 sensor were higher than those of P-SnO_2 sensor. These sensitivities of SnO_2 sensors were closely related to the physical properties such as particle size, surface area, and pore size of the SnO_2 powders in addition to the molecular sizes of the detecting gas. The recovery of SnO_2-based sensors seemed to be possible for acetonitrile and DPM. However, in the cases of DMMP and dichloromethane, the complete recovery of SnO_2-based sensors was impossible because of poisoning.