

Gas Sensors Based on Single-Walled Carbon Nanotube Field-Effect Transistor

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Single-walled carbon nanotube (SWCNT) gas sensors with field-effect-transistor (FET) structure have received much attention owing to their excellent properties such as high sensitivity, small size, room-temperature operation, and self-desorption by gate bias. In this study, SWCNT-FET was constructed via the self-assembly of a uniform SWCNT film on a Si/SiO₂ substrate, which exhibited a large current on/off ratio of up to 10⁵. This SWCNT-based FET could be used as gas sensors. Upon exposure to dimethyl methylphosphonate (DMMP, simulant of nerve agent sarin), the current of the device decreased and the threshold voltage shifted toward the negative gate voltage direction. This sensor could easily detect DMMP down to 1 ppm concentration. This sensor could also be 100% recovered when a gate voltage of 15 V is applied to the device.

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