Review

Gas Sensors Based on Semiconducting Metal Oxide One-Dimensional Nanostructures

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Abstract: This article provides a comprehensive review of recent (2008 and 2009) progress in gas sensors based on semiconducting metal oxide one-dimensional (1D) nanostructures. During last few years, gas sensors based on semiconducting oxide 1D nanostructures have been widely investigated. Additionally, modified or doped oxide nanowires/nanobelts have also been synthesized and used for gas sensor applications. Moreover, novel device structures such as electronic noses and low power consumption self-heated gas sensors have been invented and their gas sensing performance has also been evaluated. Finally, we also point out some challenges for future investigation and practical application.

1. Introduction

Semiconducting metal oxides have been known for decades to be good gas sensing materials. Ethanol sensors based on SnO_2 thick films have been commercialized for years. In 1991, Yamazoe demonstrated that reduction in crystal size would significantly increase the sensor performance [1]. This is because nanosized grains of metal oxides are almost depleted of carriers (most carriers are trapped in surface states) and exhibit much poorer conductivity than microsized grains in ambient air, hence, when exposed to target gases, they exhibit greater conductance changes as more carriers are