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Review

# Perovskite oxides for semiconductor-based gas sensors

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**Abstract**

The oxygen partial pressure dependence of the point defect concentration, and thus conductivity, in oxide semiconductors allows for their use in high-temperature gas sensors. In addition to responding to oxygen partial pressure, the resistance of oxide semiconductors can be affected by other gases, such as carbon monoxide, hydrocarbons and ethanol, which creates opportunities for developing new sensors, but also leads to interference problems. The most common oxide used in such sensors is tin oxide, although other simple oxides, and some mixed oxides, are also used. The focus of this paper is on the use of perovskite oxides in semiconductor-based gas sensors. The perovskite structure, with two differently-sized cations, is amenable to a variety of dopant additions. This flexibility allows for control of the transport and catalytic properties, which are important for improving sensor performance.


*Keywords:* Resistance-based gas sensors; Strontium titanate; Oxygen sensors

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## 1. Introduction

In response to the need for measuring gas concentrations to provide feedback control and to monitor emissions in combustion processes, gas sensors have been developed using a variety of approaches [1–7]. High-temperature sensors for use directly in the combustion environment are often based on ionic conductors. Pure ionic conductors are used in potentiometric, mixed-potential or amperometric sensors [8–12], but mixed (ionic–electronic) conductors are used in semiconductor-based sensors [13–16]. The response of semiconductor-based

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