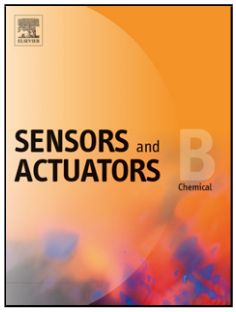

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Porous Nanostructured $GdFeO_3$ Perovskite Oxides and their Gas Response Performance to NO_x

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Highlights

- Mesoporous rare-earth orthoferrite ($GdFeO_3$) nanostructures were prepared by a facile one-step hydrothermal process.
- Structural effects of $GdFeO_3$ nanostructure on NO_x gas-response properties were systematically investigated.
- Mesosphere-like $GdFeO_3$ nanostructure exhibited the best gas-response characteristics to nitric oxide (NO) at 140 °C.
- NO gas-response mechanism of $GdFeO_3$ nanostructure was discussed.

Abstract

Gas sensing characteristics of rare-earth-based orthoferrite ($GdFeO_3$) mesoporous nanostructures were prepared by a facile one-step hydrothermal process. The structural analyses of the obtained materials showed sphere, leaf and flower-like nanostructured architectures. Further, the chemiresistive gas-response properties of the $GdFeO_3$ nanostructure were investigated with various combustible gases, such as nitric oxide (NO), nitrogen dioxide (NO_2), carbon monoxide (CO), ammonia (NH_3), hydrogen sulfide (H_2S), formaldehyde (HCHO), ethanol (C_2H_5OH) and gasoline, at different operating temperatures. The sphere-like $GdFeO_3$ nanostructure shows a significantly high resistance variation to NO compared with the other architectures, exhibits a high response (91%) when exposed to 100 ppm NO, and detects a level as low as 2 ppm (7%) at an optimum operating temperature of 140 °C. The $GdFeO_3$ nanostructure shows an excellent stability and repeatability after