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# Porous Nanostructured GdFeO<sub>3</sub> Perovskite Oxides and their Gas Response Performance to NO<sub>x</sub>

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## Highlights

- Mesoporous rare-earth orthoferrite (GdFeO<sub>3</sub>) nanostructures were prepared by a facile one-step hydrothermal process.
- Structural effects of GdFeO<sub>3</sub> nanostructure on NO<sub>x</sub> gas-response properties were systematically investigated.
- Mesosphere-like GdFeO<sub>3</sub> nanostructure exhibited the best gas-response characteristics to nitric oxide (NO) at 140 °C.
- NO gas-response mechanism of GdFeO<sub>3</sub> nanostructure was discussed.

## Abstract

Gas sensing characteristics of rare-earth-based orthoferrite (GdFeO<sub>3</sub>) 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<sub>3</sub> nanostructure were investigated with various combustible gases, such as nitric oxide (NO), nitrogen dioxide (NO<sub>2</sub>), carbon monoxide (CO), ammonia (NH<sub>3</sub>), hydrogen sulfide (H<sub>2</sub>S), formaldehyde (HCHO), ethanol (C<sub>2</sub>H<sub>5</sub>OH) and gasoline, at different operating temperatures. The sphere-like GdFeO<sub>3</sub> 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<sub>3</sub> nanostructure shows an excellent stability and repeatability after

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