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OXYGEN VACANCY ENHANCED GAS SENSING PERFORMANCE OF CEO_2/GRAPHENE HETEROJUNCTION AT ROOM TEMPERATURE

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Oxygen vacancies (Ov) as the active sites have significant influences on the enhanced gas sensing performance of metal oxide. In this paper, hydrothermal process is adopted to fabricate the composites of graphene and CeO2 nanoparticles, in which H2O2 (L(+)-ascorbic acid (AA)) as the oxidant (reducing agent) is adopted to reduce (increase) the concentration of Ce3+ ions. It is found that the sensitivity of the composites to NO2 is increased gradually, as the concentration of Ce3+ is increased from 14.6% to 50.7%, but decreases if the concentration of Ce3+ is higher than 50.7%. First-principles calculations illustrates that CeO2 becomes metallic at the Ce3+ concentration of < 50.7%, the chemical potential of electrons on surface decreases and the fermi level shifts upwards, resulting in reduced Schottky barrier height (SBH) at the CeO2/Graphene interface, enhanced interfacial charge transfer and high gas sensing performance. However, deep energy level is induced at the Ce3+ concentration of > 50.7%, and CeO2 behaves as a semiconductor, the fermi level is pinned at the interface. As a result, the density of free electrons is reduced, leading to increased SBH and poor gas sensing response.

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