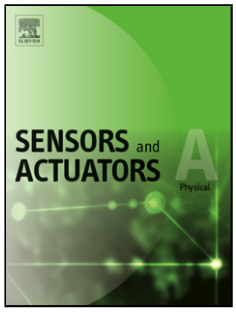

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Quantitative Description of Ag nanoparticles-Graphene Hybrids with Optimized Morphology on Sensing Performance

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Research Highlight

- We have proposed to prepare a variety of Ag NPs-graphene hybrids with different morphology towards NH_3 sensing experiments, and extract adsorption heat from ammonia sensing profiles based on kinetic adsorption theory.
- Ag NPs morphology feature parameters have a great influent on their catalytic activity and sensing performance, and appropriate size and coverage of Ag NPs well dispersed on graphene resulting in higher catalytic activity is the key point of improved sensing performance.
- The maximum response of Ag NPs-graphene hybrids with optimized morphology is about 2 times the average response of others.
- Using catalytic activity as intermediate, the quantitative description of surface morphology feature parameters impact on sensing performance of Ag NPs-graphene hybrids well explains the mechanism of improved sensing performance.

Abstract

Due to their synergistic effect, metal nanoparticles (NPs)-graphene hybrids exhibit better catalytic activity and sensing performance in bio application, chemical sensors and Surface-enhanced Raman spectroscopy substrate than most of other hybrids. To give quantitative description of gas sensing performance depending on metal NPs morphology, we have experimentally acquired NH_3 sensing profiles of Ag NPs-graphene hybrids with different morphology, and extracted adsorption heat according to the Langmuir adsorption theory. The relation between sensing performance and catalytic activity of Ag NPs-graphene hybrids has been established. The optimized morphology as size, coverage and degree of dispersion of Ag NPs on graphene results in higher catalytic activity, which is the key point of enhanced sensing