

2nd International Conference and Exhibition on

POLYMER CHEMISTRY

November 15-17, 2017 | San Antonio, USA

DC electrical conductivity based polyaniline@graphene/nickel oxide nanocomposite as ammonia sensor

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Polyaniline@graphene/nickel oxide (Pani@GN/NiO), polyaniline/graphene (Pani/GN), polyaniline/nickel oxide (Pani/NiO) nanocomposites and polyaniline (Pani) were successfully synthesized and tested for ammonia sensing. Pani@GN/NiO, Pani/NiO, Pani/GN and Pani were characterized by using X-ray diffraction, UV-vis spectroscopy, Raman spectroscopy, scanning electron microscopy and transmission electron microscopy. The as-prepared materials were studied for comparative DC electrical conductivity and the change in their electrical conductivity on exposure to ammonia vapors followed by ambient air at room temperature. It was observed that the Pani@GN/NiO nanocomposite showed about 99 times greater amplitude of conductivity change than pure Pani on exposure to ammonia vapors followed by ambient air. The fast response and excellent recovery time could be probably ascribed to relatively high surface area of Pani@GN/NiO nanocomposite, proper sensing channels and efficaciously available active sites. Pani@GN/NiO was observed to be good in selectivity towards ammonia because of comparatively high basic nature of ammonia than other volatile organic compounds (VOCs) tested. The sensing mechanism explained on the simple acid base chemistry of polyaniline.

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