MODIFICATION OF STAINLESS STEEL SURFACE FOR MWCNT INKJET PRINTED GAS SENSOR

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Abstract

Austenitic stainless steel foils (304 SS) were used as catalytic substrates for the growth of multi-walled carbon nanotubes (MWCNTs) by using thermal chemical vapor deposition (CVD) technique. Before the MWCNT growth, the surface of substrate was modified using polishing and oxidation treatments. To understand the effect of this modification on the growth of MWCNTs, the as-received 304 SS was also investigated as a comparison. Scanning electron microscopy (SEM), Raman spectroscopy and energy dispersive X-ray spectroscopy (EDS) were employed to study the morphology of MWCNTs and elemental compositions of their substrates. Furthermore, the synthesized MWCNTs associated with dimethyl sulfoxide (DMSO) compound were prepared as the conductive ink used for the fabrication of room temperature ammonia (NH_3) gas sensor. The inkjet printing technique was considered for the deposition of MWCNT sensing films on the silver electrodes. The experimental results reveal that the ink obtained from MWCNTs grown on the modified 304 SS exhibits the high sensitivity and fast response to NH_3 at room temperature.

Keywords: Multi-walled carbon nanotubes, Stainless steel, Inkjet-printed gas sensor

Introduction

Ammonia (NH_3) as high toxic gas has been widely used in various manufacturing industries. However, the leakage of NH_3 is often reported as a serious accident for affecting the lives and assets of employees and entrepreneurs. Although the gas leak detectors are used, the high price of them is a main problem for small enterprises. Recently, printed electronics have been widely known as the new technique for industrial revolution of

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