Synthesis and characterization of molydenumtrioxide via hydrothermal method for application in gas sensors

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Abstract: Molydenumtrioxide nanoribbons (MoO₃ NRbs) were assembled from smaller to larger units through thermal reaction via hydrothermal method, which was operated at 200°C for 18 hrs. Ruthenium nanoparticle (Ru NPs) was used for improving physical properties especially surface areas are increasing, which the detection of gas molecular was enhanced. Sodium molybdate and ruthenium (III) acetylacetonate were used as the precursor. Sensing film preparation of pure MoO₃ NRbs and 0.25, 0.50 and 1.00 wt% Ru loading MoO₃ NRbs (Ru-MoO₃ NRbs) was coated onto Au electrode by spin coating technique. The phase and crystallinity of MoO₃ NRbs and Ru-MoO₃ NRbs were characterized by x-ray diffractometer (XRD). The morphologies of all MoO₃ NRbs were investigated by scanning electron microscopy (SEM) and high resolution transmission electron microscopy (TEM) technique. The elemental compositions were characterized by energy dispersive x-ray spectrometer (EDS) technique. The results of SEM and TEM show that NRbs were ribbon shape with widths from 50 nm to 250 nm and lengths up to 300 nm, and sensing film have thickness approximate 10–11 µm. The results of detecting gas and possible mechanisms are discussed.

Keywords: Gas sensor; Molydenumtrioxide; Hydrothermal