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Efficient growth of single wall carbon nanotubes SWCNTs by PECVD technique for gas sensing and field emission applications

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Gas sensors are getting much attention and are being highly focussed by scientific community in the field of nanoscience and nanotechnology since last decade. A good sensor must possess high sensitivity, high selectivity and good response recovery characteristics. The existing sensors may lack in one of the property or another and are being operated at high temperature. To obtain such a highly modified and efficient sensor is very difficult task. However, we have approached our best to design and fabricate the best possible gas sensor. For this approach, we have grown single walled carbon nanotubes (SWCNTs) on Fe based silicon substrate by plasma enhanced chemical vapour deposition (PECVD) technique at low temperature 6500C with optimization of parameters like temperature, pressure and deposition time. From the as grown SWCNTs, SWCNT gas sensors have been fabricated with gold electrodes having distance 2 mm. The as grown SWCNTs have been properly investigated by field emission scanning electron microscope (FESEM), high resolution transmission electron microscope (HRTEM) and Raman spectroscopy. The as fabricated SWCNT gas sensors have been tested on the exposure of ammonia (NH₃) gas in a self assembled apparatus. The variation in resistance, conductance and sensor response of SWCNT sensors has been properly investigated. All the gas sensing results are in good agreement with the reported results and are in good support to design SWCNT sensors for monitoring the environment, industrial and other defence sectors at a proper stage without any major loss. However, we have also investigated the field emission properties of as grown SWCNTs. High value of current density at low turn on voltage has been observed. The higher value of field enhancement factor has also been calculated. Because of this, SWCNTs are getting much application field in the said areas.

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