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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 650°C 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 2mm. 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. All the characteristics of the sensor like sensor response, recovery time, repeatability, selectivity, effect of concentration and temperature has been investigated at room temperature. In addition of this, 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.

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