

Gas sensing with carbon nanotube networks

Chris Morgan, Mark Baxendale

Physics Department, Queen Mary, University of London, Mile End Road, London, E1 4NS

c.j.morgan@qmul.ac.uk

The electronic characteristics of single walled carbon nanotube (SWNT) networks are shown to have a strong dependence on the thickness of deposition. Variable range hopping is identified as the conduction mechanism. The conductometric sensing dynamics at room temperature for molecular oxygen and nitrogen exposure are examined and found to have two distinct time constants τ_{fast} and τ_{slow} . Deposition of the SWNT network in contact with an oxidised semiconductor substrate forms a Nanotube-Metal on Silicon (NTMOS) capacitor. The total capacitance is determined by the oxide thickness and the thickness of depletion layer, which depends on the carrier concentration in the silicon substrate and the applied DC voltage between the SWNT network and the semiconductor. The presence of gases perturbs the surface potential of the SWNT network thus shifting the flat band potential of the device.