Poster

EFFECT OF HYDROGEN ADSORPTION ON ELECTRICAL TRANSPORT PROPERTIES OF Pd COATED CARBON NANOTUBE

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Dramatic change in electrical conductivity of carbon nanotube (CNT) according to the gas absorption was reported by many research groups [1, 2]. We have also predicted theoretically that the electrical transport properties are changed when the gas molecules are adsorbed on the surface of CNT [3]. However, hydrogen molecules actually are not adsorbed on CNT, so electrical transport properties of CNT are not changed at hydrogen atmosphere. In order to find out the reason for the lack of interactions between CNT and hydrogen molecules, we calculated the interactions between CNT and hydrogen molecules theoretically.

On the basis of the theoretical calculation, CNT was functionalized with palladium nanoparticles, which are well known as a catalyst to dissociate the hydrogen molecule to atom, by simple chemical-solution route to improve the interactions between CNT and hydrogen molecules (Fig. 1). Sensor devices were prepared with this Pd-CNT and characterized their electrical transport in hydrogen atmosphere at room temperature. Hydrogen molecules dissociate into atomic hydrogen on the surface of palladium nanoparticles and then easily adsorb on the surface of CNT resulting the dramatic change of electrical conductivity (Fig. 2). The possible application of this device in hydrogen detection will be discussed.

References:

[1] J. Kong, N. R. Franklin, C. Chou, M. G. Chaplin, S. Peng, K. Cho, and H. Dai, Science, **287** (2000) 622.
[2] S. Peng and K. J. Cho, Nano Lett., **3** (4) (2003) 513.
[3] Hyunju Chang, Jae Do Lee, Seung Mi Lee and Young Hee Lee, App. Phys. Lett., **79** (23) (2001) 3863.

Figures:

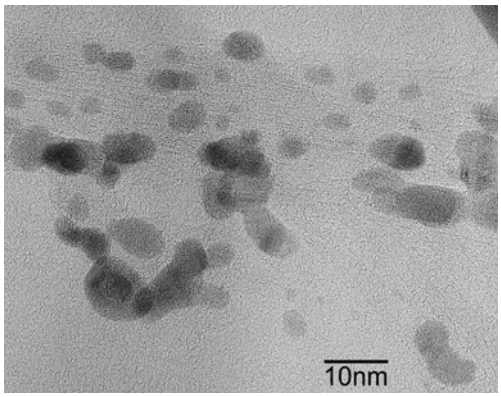

Fig. 1. TEM image of CNT coated with palladium nanoparticles

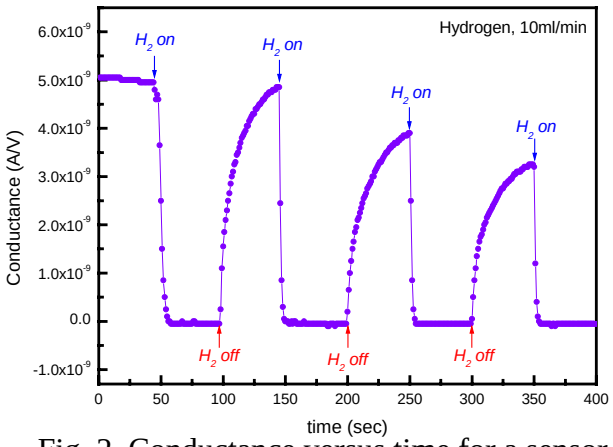

Fig. 2. Conductance versus time for a sensor exposed to hydrogen gas.