Master thesis project

Flexible and transparent electrodes based on interconnected carbon nanotube mesh network

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Project description

There is a great demand in flexible and transparent electrodes due to the rapid growth in electronics such as flexible electronics, solar cells and displayers. Indium tin oxide (ITO) is the most commonly used material for transparent electrodes but indium is a rare metal on the earth, so ITO price is expected to increase continuously. In addition, ITO is very brittle so it can't withstand deformation such as repeated bending and twisting, which are very important for flexible electronics.

In this project, we plan to develop an interconnected carbon nanotube structure as transparent electrodes. A novel electrospinning method will be used to fabricate the template for carbon nanotube growth so that the as-grown carbon nanotubes are covalently bonded to form an interconnected mesh network, which can be used as flexible and transparent electrodes. This novel interconnected carbon nanotube mesh network makes fully use of the excellent properties of carbon nanotubes and yet greatly decreases the contact resistance between the carbon nanotubes. The project includes the material growth, material transfer and characterization.

This project will focus on experiment work. The work will be performed in the MC2 cleanroom and the EMSL lab. Various equipments for carbon nanotube growth and characterization will be applied in the project, this includes Black Magic for carbon nanotube growth, SEM, TEM, Raman spectrascropy, probe station, etc for electrical and mechanical characterization.

Students with a background in material, electronics, nanotechnology, physics or equivalent is preferred. Experience in cleanroom work is a plus.

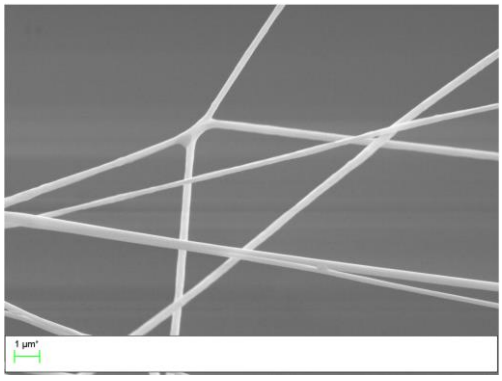

Fig. 1 Template for interconnected carbon nanotube growth fabricated from electrospinning.

References

1. Fu Y. et al., Templated Growth of Covalently Bonded Three-Dimensional Carbon Nanotube Networks Originated from Graphene. Advanced Materials, 2012.