



Research Assignment - 2007

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Title of research assignment

Three Dimensional Carbon Nano-tube Based Thermal Sensors

Research abstract

A major focus area of my research program is to build devices using nanomaterials. That is, we acquire nanomaterials (gold nanoparticles and carbon nanotube) from vendors or from collaborators, and then make devices with them. In order to make a device with a nano component, we first make a micro platform and then assemble nanomaterials on top. Then, we utilize a room temperature assembly method to attach nanomaterials (Au nanoparticles and carbon nanotubes) onto silicon chips and then test their properties. One specific test is to make sure that the conductive path is formed between the two assembly electrodes, in this test, we measure the resistance between two metal electrode pads. For the carbon nanotube devices, we also vary the temperature and at the same time monitor their resistance. Since their resistance changes with temperature, they can act as a miniature thermal sensor.

Research activities/experience

The project will involve assembling carbon nanotubes onto a micro platform and testing their properties. The carbon nanotubes and the platforms will be provided. The assembly is fairly simple and quick. Depending on the background and the interest of the participant, one can do some measurements on the assembled nanodevice, can optimize the assembly parameters and can also test the thermal sensor. The training to use the equipment for assembly and also handling the nanoscale materials will be provided.

Expectations of RET

Most of my research is group work on experimental, hands-on projects which suit teachers who are interested in making and testing devices (no prior background in sciences or engineering is required, but is helpful). There are also some open theoretical investigations that one can pursue such as optimizing assembly parameters, or modeling devices, yet these probably would take more time than the allotted 6 weeks, yet we would be interested in working in these topics as well.

Special skills or interests that would help a YSP participant with this assignment (i.e., an interest in physics, experience with specific laboratory equipment, etc.)

No special skills are required. Moreover, interest in experimental work and interest in engineering and science would be a plus. Experience with microscopes would be useful.

Lab safety/issues unique to this laboratory. A general Lab Safety Overview will be presented by Environment Health and Safety to both RET and YSP participants prior to the beginning of lab assignments.

Material samples will be small and non-hazardous. No hazardous chemicals will be used.

Suggested literature to be reviewed prior to beginning this research assignment.

There is reference for integrated circuit fabrication:

Introduction to Microelectronic Fabrication by Richard C. Jaegar, 2nd Edition is textbook for the class I teach (cover the basics of micro and nano fabrication at an introductory level) and I can provide extra copies to the interested parties ahead of time. My webpage lists our latest papers on nanodevices, the main ones will be the ones that start with a title “Three dimensional dielectrophoretic assembly...”

Research/Lab Summer Hours 10:00 a.m. – 6:00 p.m. Monday through Thursday
 Monday through Friday

Scheduled Research/Lab Meetings : a.m. – : a.m. Daily Wednesday To be
 Monday Thursday determined
 Tuesday Friday

Lab/research project URL

<http://www.ece.neu.edu/faculty/mehmetd/>

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