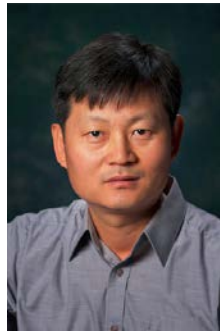


## Mechanical Engineering Seminar



**Tae-Youl Choi**

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**University of North Texas**

### **Thermal Properties of 1-D, 2-D, and 3-D Materials**

*Friday, August 11, 2017 at 11:00AM, Room 173 Light Engineering Building*

#### **Abstract**

In this talk, I would like to introduce three approaches in small scale thermal science and engineering. The first part of the talk will focus on the utilization and characterization of nanosystems, *i.e.*, carbon nanotubes and nanowires. Simultaneous measurements of thermal conductivity and Seebeck coefficient will be presented in the first part. To this end, a microfabricated device which is subsequently tailored by focused ion beam (FIB) is used to place a single nanowire across the designated metal electrodes. Nanomanufacturing by FIB was implemented to provide a platform for nanoscale measurement. In the second part, a novel method of measuring temperature and thermal conductivity of 2-D materials such as carbon nanotubes films and graphene at microscale level will be presented. This method involves with a cellular-level, high-resolution temperature sensing system using a micropipette thermocouple sensor. In addition, the 3-omega method was employed to measure thermal conductivity of 3-D cellular structures. To this end, we have developed a novel microheater technology, which allows temperature detection, at microscale levels. The microscale sensor measures the thermal response (periodic temperature variation subject to modulated heat input) of biological samples; the measured data combined with mathematical models was used to determine the thermal conductivity. The data output will be used for early disease detection, which is derived from differences in thermal properties in an *in vitro* human melanoma model of progression as well as thermal properties of ductal carcinoma breast cancer.

#### **Biography**

Dr. Choi is an associate professor of Mechanical and Energy Engineering Department at the University of North Texas. He has earned his BS and MS from Seoul National University. And he is awarded PhD from University of California, Berkeley in 2002. He was a lecturer at the Department of Mechanical and Process Engineering at ETH Zurich, Switzerland before he joined UNT in 2006.

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