SMU Department of Mechanical Engineering

*Presents*

# "NANO-DEVICES FOR ENHANCED COOLING, STORAGE AND SENSING"


## DR. DEBJYOTI BANERJEE

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JUNKINS 110


**ABSTRACT:** *Our research combines: (a) cooling and thermal storage technologies with (b) nano-technology. In the thermal area – we are investigating micro-scale heat transfer phenomena in boiling. Micron-scale features in boiling cause the formation of "cold spots". These cold-spots are able to transmit almost 60-90% of the total heat transfer. Using Carbon Nano-Tube coated surfaces cooling was enhanced by 30-300%, probably due to enhancement of these cold spots in boiling. Using silicon nano-fins - cooling was enhanced by 120%. The applications are in materials processing and thermal management (cooling). We have also demonstrated cooling enhancement by ~8-30% using nanofluids. We are currently exploring the use of nanofluids for solar thermal energy conversion. DPN™ (Dip Pen Nanolithography) is a versatile technology that leverages microfluidic ink delivery systems with Scanning Probe Microscopy. In earlier studies the DPN process was enhanced through the development of commercial microfluidic devices called "Inkwells™". We are currently developing the next generation microfluidic devices for DPN (e.g., Fountain Pen Nanolithography). The applications are in nano-catalysis, combinatorial nano-synthesis, bio-nanotechnology (e.g., cancer nanotechnology), maskless-lithography and nano-sensors for homeland security, bio-security and explosives detection (e.g., "nano-nose" and "nano-tongue"). We have invented a process for synthesizing Carbon Nanotubes of a single chirality (either metallic or semi-conducting) using DPN.*


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