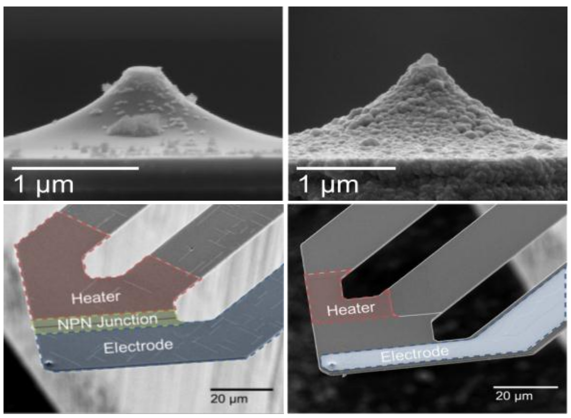
NANOHOUR

Wednesday, October 27, 2010 3:00 pm
Beckman Institute - Room 3269

Recent Developments in Nano-Thermal Probe Technology: Diamond Tips and Electro-Thermal Control

Patrick Fletcher, Mechanical Science and Engineering

Graduate Student with Professor William King



Microcantilevers with integrated heaters can be used to control nanometer scale temperature fields for data storage, materials analysis, and thermomechanical processing. This talk will focus on recent efforts to develop novel microcantilevers with integrated thermal elements for microscopy and nanomanufacturing. The first part of the talk describes self-heating atomic force microscope (AFM) cantilevers whose tips are protected by nanocrystalline diamond, increasing tip longevity 1000x. Such devices enable nanomanufacturing at centimeter length scales. The second part of the talk describes AFM cantilevers whose tip temperature and tip electric potential can be simultaneously and independently controlled. These electrothermal devices facilitate combined nanoscale electronic and thermal measurements.

Autonomic Restoration of Conductivity for Li-ion Battery and Microelectronic Applications

Dr. Ben J. Blaiszik, Materials Science and Engineering

Postdoctoral Research Associate with Nancy Sottos and Scott White

A variety of complex damage mechanisms in Li-ion batteries and microelectronics can lead to a significant loss of conductivity, and eventual system failure. For Li-ion batteries, cracking, deterioration, and electrochemical pulverization occur during the massive volume changes associated with the intercalation/deintercalation of Li^+ ions during charge and discharge. As this damage accumulates, there is a significant degradation of the efficiency, and eventually failure of the battery. In microelectronics, mechanical or thermal damage can lead to a loss of conductivity across a damaged pathway and performance degradation of the overall circuit. Deriving from bioinspired concepts, we propose to use damage in the material as a trigger to autonomically initiate a self-healing response for restoration of conductivity in both Li-ion battery electrode and microelectronic applications. Through restoration of conductivity in these damaged materials, battery and microelectronic device lifetime and reliability may be increased. In this presentation, we describe the diverse set of potential applications, the testing apparatus, and the self-healing system development for restoration of conductivity

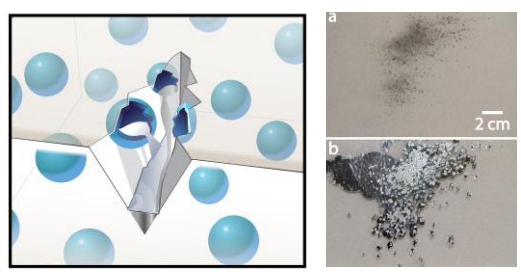


Figure 1: (L) Schematic showing the concept of autonomic release of a conductive liquid metal into a damaged area for restoration of conductivity. (R) (a) Liquid metal filled microcapsules dispersed on a glass slide and (b) crushed to demonstrate release of liquid metal.

Coffee and cookies will be served

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