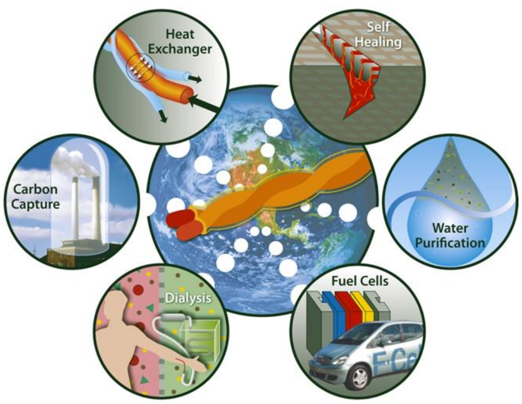
NANOHOUR

Wednesday, November 16, 2011 3:00 pm
Beckman Institute - Room 3269

Smart Composites Fabricated from VaSC: A Platform Technology

Hefei Dong, Materials Science and Engineering
Graduate Student with Professor Jeffrey Moore

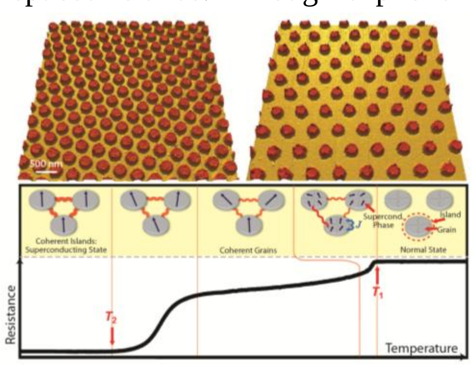


Vaporization of Sacrificial Component (VaSC) is a newly developed technique which provides a robust, scalable and facile synthetic route to fabricate microvascular composites. VaSC takes advantage of a thermally degradable polymeric fiber, when removed by depolymerization and volatilization, creates microvascular network inside the composite material. We demonstrated the pluripotency of microvascular composite by circulating functional liquids in the composite. Moreover, a new diverse set of functionalities can be demonstrated by using coated sacrificial fiber (CSF) as the building block for the next generation of smart composites. Coating enables intermingled and independent microvascular networks inside a composite and inserts energy/mass transit properties between those networks by regulating the permeability of coating material. The application of CSF fits in a wide spectrum of research areas from water purification to gas exchange to fuel cells. This VaSC procedure is an enabling platform technology for the design of advanced, smart composites.

Unusual Proximity Effects in Mesoscopic Superconductor-Normal Metal-Superconductor Arrays

Serena Eley, Department of Physics
Graduate Student with Professor Nadya Mason

Systems of superconducting islands on normal metal films provide a tunable medium with which to study the superconducting proximity effect, phase transitions, and vortex dynamics. We report transport measurements on triangular arrays of mesoscopic, proximity-coupled Nb islands placed on normal metal Au films. In response to decreasing temperature, the arrays undergo a two-step transition from a resistive state to a true, zero-resistance superconducting state. We characterize the superconducting transitions in these systems as a function of island thickness and spacing, and find unexpected behavior in the widely spaced islands. Through a phenomenological model, we describe these transitions as characterized by stabilization of superconductivity on each island via a weak coupling to and feedback from its neighbors. We provide evidence that the second step is a vortex-binding transition characteristic of 2D superconductors in zero-field. Moreover, in a magnetic field, the arrays exhibit intriguing behavior. In response to sweeping the field, we observe resistance oscillations, manifestations of competing magnetic ground states and correlated vortex motion. For fixed fields, sweeping the temperature results in unusual cusp-like behavior in the resistance, which is possibly indicative of a series of thermally-induced vortex rearrangements.



Coffee and cookies will be served
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