Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

**Dynamic self-assembly of nanocomposite ring structures through the interaction of thermodynamic and energy-dissipating processes**
HAIQING LIU, ERIK SPOERKE, MARLENE BACHAND, STEVEN KOCH, BRUCE BUNKER, GEORGE BACHAND, Sandia National Laboratories —
Self-assembly of nanostructured materials occurs in thermodynamic and energy-dissipating systems. We've described a unique self-assembly scheme in which non-equilibrium nanocomposites are formed by the interaction of energy dissipation and thermodynamics. Three distinct composite structures (mobile linear, rotating circular and immobile aggregated composites) are formed when streptavidin-coated quantum dots are introduced to biotinylated microtubules that are being transported by kinesin. The circular nanocomposites occur only in a delicately balanced regime when thermodynamic and energy-dissipating components interact cooperatively. Linear translation and axial rotation of microtubules drive the formation of mechanical strain within the composites, which ultimately defines the structural shape and rotational direction. Disassembly of these composites occurs spontaneously, as well as induced by the addition of free biotin. Exploitation of dynamic self-assembly promises nanostructured materials with revolutionary behaviors that are unattainable through conventional self-assembly.
*Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, or the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Haiqing Liu
Sandia National Laboratories

Date submitted: 27 Nov 2007 Electronic form version 1.4