Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Localized, plasmon-mediated heating from embedded nanoparticles in nanocomposites[1] SOMSUBHRA MAITY, LORI DOWNEN, JASON BOCHINSKI, LAURA CLARKE, Dept. Of Physics, NC State University, Raleigh, NC 27695 — Metallic nanoparticles exhibit a surface plasmon resonance which, when excited with visible light, results in a dramatic increase in the nanoparticle temperature. Previously such localized heating has been primarily employed in biomedical research and other experiments involving aqueous environments. In this work, we investigated use of the nanoparticles in solid phase to re-shape, bond, melt, and otherwise process nanofibrous mats of ∼200 nm diameter nanofibers doped with ∼80 nm spherical gold nanoparticles. Under low light intensities (100 mW/cm^2 @ 532 nm) and dilute nanoparticle loading (∼0.15% volume fraction), irradiation of a few minutes melted nanofibrous mats of poly (ethylene oxide) (T_m = 65 degree C). Control samples without gold nanoparticles displayed no melting. Because the heat is generated from within the material and only at the nanoparticle locations, this technique enables true nanoprocessing – the non-contact, controlled application of heat at specific nano-sized locations within a material to effect desired local changes. Funded by CMMI-0829379.

[1]Funded by CMMI-0829379.

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Date submitted: 09 Dec 2009 Electronic form version 1.4