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Photothermally-induced rotation of gold nanorods within a polymer matrix to probe local nanocomposite properties[1] SOMSUBHRA MAITY, LAURA CLARKE, JASON BOCHINSKI, NC State University — The photothermal effect of gold nanorods embedded in polymer thin films produces localized heat depending upon the relative orientation of the rod and incident light field polarization. Simultaneous application of electric and light fields enables creation of thin films having aligned nanorods from those with initially randomly-oriented particles, as well as subsequent manipulation of rod orientation within the material environment. This is due to local melting of the polymer in the immediate vicinity of the particles which facilitates particle re-orientation. Conversely, solely under sufficient resonant light irradiation, initially aligned nanorods tend to randomize their orientation when the local environment melts. The rotational dynamics of the rods (i.e., alignment fidelity and rotation speed) depends on the polymer melt viscosity and thus directly reflects the local temperature around the rods which may vary significantly from the bulk temperature: conveniently, both rod orientation and bulk temperature can be simultaneously determined using optical methods. Thus, this combined approach provides both an in situ post-fabrication technique to manipulate alignment of rods and a tool to probe local temperature in polymer nanocomposites.

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