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**Utilizing photothermal heating by metal nanoparticles within polymer composites** SOMSUBHRA MAITY, JASON BOCHINSKI, LAURA CLARKE, NC State University — Photothermal heating by metal nanoparticles have been extensively researched in solution environments for applications such as cancer treatment and drug delivery, but very few have explored photothermal heating in solids, such as metal nanoparticle-polymer composites. When metal nanoparticles are excited by light resonant with the particle's surface plasmon, non-radiative relaxation efficiently generates heat. Thus, this photothermal effect facilitates *in situ* thermal processing of polymeric materials via externally-controllable light excitation. By embedding fluorophores in the composite, a sensitive relative fluorescence approach can be utilized to dynamically monitor the average temperature within the sample as it is thermally processed. With modest light intensities and dilute nanoparticle concentrations, controllable temperature changes of several hundred degrees Celsius have been achieved. We discuss various cooling mechanisms and their respective effect on the heating process. The spatial specificity and temperatures achieved can potentially be used for triggering phase transitions, cross-linking, or enabling region-specific chemical reactions within a polymeric material.

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