Abstract Submitted
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Annealing polymer nanocomposite fibers and films with photothermal heating: effects on overall crystallinity and resultant mechanical properties[1] VIDYA VISWANATH, SOMSUBHRA MAITY, JASON BOCHINSKI, LAURA CLARKE, RUSSELL GORGA, North Carolina State University — Metal nanoparticles embedded within polymeric systems can be made to act as localized heat sources thereby aiding in-situ polymer processing. This is made possible by the surface plasmon resonance (SPR) mediated photothermal effect of gold nanoparticles, wherein incident light absorbed by the nanoparticle generates a non-equilibrium electron distribution which subsequently transfers this energy into the surrounding medium, resulting in a temperature increase in the immediate region around the particle. The current research demonstrates this effect in polymer nanocomposite systems, electrospun nanofiber mats and thin films, which have been annealed at temperatures above the glass transition and below melting. A non-contact temperature measurement technique utilizing embedded fluorophores has been used to monitor the average temperature within samples. The effect of annealing methods (conventional and plasmonic), annealing conditions (temperature and duration) and cooling mechanisms on the morphology, crystallinity, and mechanical properties of polymeric nanocomposite systems will be discussed. The specificity of plasmonic heating coupled with the inside-outside approach of annealing presents a unique tool to thermally process polymers.

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Vidya Viswanath
North Carolina State University

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