Abstract Submitted
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Annealing polymer nanofibrous nanocomposite mats via photothermal heating: effects on overall crystallinity, morphology, and mechanical properties[1] RUSSELL GORGA, LAURA CLARKE, JASON BOCHINSKI, VIDYA VISWANATH, SOMSUBHRA MAITY, NC 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 mediated photothermal effect of metal 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. Here we demonstrate this effect in polyethylene oxide-gold nanoparticle electrospun nanofibrous mats, which have been annealed at temperatures above the glass transition. A non-contact temperature measurement technique utilizing embedded fluorophores (perylene) has been used to monitor the average temperature within samples. The effect of annealing methods (conventional and photothermal) and annealing conditions (temperature and time) on the fiber morphology, overall crystallinity, and mechanical properties is discussed. In conclusion we demonstrate that the specificity of plasmonic heating coupled with the inside-outside approach of annealing presents a unique tool to improve crystallinity, and therefore mechanical properties, of the polymer mats while maintaining the unique nanofibrous morphologies.

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