Abstract Submitted
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Controllable polymer degradation via photothermal heating of embedded metal nanoparticles[1] HONGLU HUANG, RUSSELL E. GORGA, Fiber and Polymer Science, College of Textiles, North Carolina State University, Raleigh, NC, DANIELA FONTECHA, GABRIEL FIRESTONE, JASON R. BOCHINSKI, LAURA I. CLARKE, Department of Physics, North Carolina State University, Raleigh, NC — Polyethylene cyanoacrylate (PECA) is a thermally degradable polymer that can be fabricated at room temperature by controlled exposure of water or organic solvent to the monomer. When fabricated from residual water on the surface of starch, the resulting biodegradable composite has excellent tensile properties and well-defined thermal degradation that occurs above 180 C. After one hour at 200 C, degradation and evaporation of the volatile by-products result in removal of most of the PECA mass and complete loss of structural integrity. Neat PECA can also be formed at room temperature by mixing monomer with dimethylformamide (DMF) and then removing the residual DMF through heating, water exchange, or exposure to vacuum. In either case, dilute concentrations of metal nanoparticles can be incorporated within the material so that heat can be generated internally from the photothermal effect. In particular, when exposed to the light resonant with the embedded nanoparticle's localized surface plasmon resonance, the particles generate heat that can be utilized to either create mesoscopic voids within an otherwise intact sample or to explore novel degradation strategies.

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