Abstract Submitted
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Carbon Microtubes from Chicken Feathers. MELISSA M. MILLER, RICHARD P. WOOL, Department of Chemical Engineering, University of Delaware — Chicken feathers, an agricultural waste problem, are a promising bio-based alternative to composite reinforcement. Approximately 5 billion pounds of chicken feathers are produced per year in the United States poultry industry alone. Containing 47.83% carbon, chicken feathers are hollow and strong in nature due to the 91% keratin content. Carbonized chicken feather (CCF) fibers are produced by heating to 220 $^\circ$C for 26 hours to optimize the crosslinking of the amino acids (predominantly cysteine). The feathers are then heated at 450 $^\circ$C for an additional two hours to reduce the content to mainly carbon. Wide angle xray scattering shows a structural change in the carbonized fiber from an interplanar spacing of 4.4 Å (d_{200}) in the raw feather to 3.36Å in the CCF, resembling 3.43 Å of commercial fiber. Scanning electron microscopy confirms that the hollow structure is kept intact. Dynamic mechanical analysis shows a 194% increase in the storage modulus of the composite from 0.730 GPa to 2.145 GPa at 35 $^\circ$C with the addition of only 3.45 wt% CCF mat. Assuming a density of 1 g/cm^3 the upper limit of the fiber modulus is approximately 40 GPa, compared to 3 GPa for the natural keratin fiber. The low cost carbon microtubes are being explored for polymer composite reinforcement and Hydrogen Storage substrates. Supported by USDA-NRI.

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