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A Thermal Analysis Based Approach to Obtain High Carbonaceous Fibers from Chicken Feathers

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Abstract : Useful carbon fibers were derived from chicken feathers (PCFs) based on a two-step pyrolysis method. The collected PCFs were cleaned and categorized as black, white and brown. Differential scanning calorimeter (DSC) and thermo-gravimetric analyzer (TGA) were systemically used to design the pyrolysis steps. Depending on colors, feathers exhibit different glass transition (Tg) temperatures. Long-time heat treatment applied to the feathers emerged influential on the surface quality of the resulting carbon fibers. Fourier Transformation Infrared (FTIR) examination revealed that the extent of disulfide bond cleavage is highly associated with the feather melting stability. Scanning electron microscopy (SEM) examinations were employed to evaluate the morphological changes of feathers after pyrolysis. Of all, brown feathers were found to be the most promising to turn into useful carbon fibers without any trace of melting and shape distortion when pyrolysis was carried out at 230°C for 24 hours and at 450°C for 1 hour.

Keywords : poultry chicken feather, keratin protein fiber, pyrolysis, high carbonaceous fibers
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