

The Production and Applications of Cellulose Nanofibers from Soybean Hulls as Water Filters

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Waste biomass material can be harnessed to be useful in several ways, from creating energy to creating novel materials. Using biomass also has the advantage of being able to decrease the amount of waste product created. Cellulose nanofibers have many different uses, ranging from making calorie-free foods, creating plastics and glasses, and creating multiple different types of paper materials as well as cosmetics. In this project, a method was created to break, create, and remodel cellulose nanofibers from soybean hulls, which are biomass waste products resulting from the production of chicken feed. Various chemical and mechanical processes were used to break down the soybean hulls. These treatments included a dilute acid hydrolysis, a homogenization treatment, a sodium hydroxide treatment, and an ultrasound. These processes resulted in a cellulose fiber that is 1000 times thinner than a human hair and can be used in a variety of industry applications. Two filters were created to show a potential application of the nanofibers. The filters were created to filter out harmful bacteria such as *Escherichia coli*. Both filters were more successful than the control filter in the filtration of nickel powder as well as *E. Coli*. These filters can be made for 50 cents per cubic inch, which gives them great promise in being used world-wide to help provide clean water for countries in need.