



## Wood Biochar Use in Supercapacitors

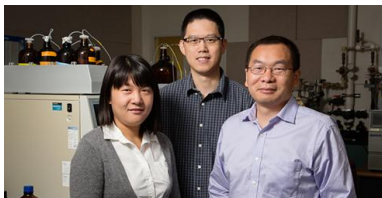
ISTC researchers investigated the use of wood biochar in supercapacitors. Many supercapacitors today use activated carbon, which is typically derived from fossil fuel products. By using wood biochar instead of fossil fuels the supercapacitors and the products they comprise become more sustainable. Also, activated carbon is often treated with harsh chemicals to prepare it for use in supercapacitors and these chemicals can be avoided when using wood biochar.

When wood is pyrolyzed, it maintains its highly ordered macropore structure and becomes 98 wt% carbon (the rest being oxygen). The wood biochar has a specific surface area of  $400 \text{ m}^2 \text{ g}^{-1}$  which is similar to activated carbon ( $\sim 500 \text{ m}^2 \text{ g}^{-1}$ ).

In addition the wood biochar electrodes have a potential window of 1.3 volts and exhibit typical rectangular-shape voltammetric responses and fast charging-discharging behavior ( $14 \text{ F g}^{-1}$  gravimetric capacitance). If the wood biochar is modified with a weak nitric acid solution the capacitance increases seven-fold ( $115 \text{ F g}^{-1}$ ). Both the original wood biochar and the modified wood biochar electrodes were stable for 5000 charge-discharge cycles without performance decays.

All these properties make wood biochar a good potential replacement for activated carbon.

This research was funded by the Illinois Hazardous Waste Research Fund and the HeteroFoaM Center (an Energy Frontier Research Center funded by the [U.S. \(United States\)](#) Department of Energy's Office of Basic Research; award #DESC0001061).



Junhua Jiang (right) and two graduate students Lei Zhang (left) and Xinying Wang (center) who developed biochar supercapacitors. (Photo by L. Brian Stauffer - [U. of I. \(University of Illinois\) News Bureau](#))

Energy

Pollutants

Waste Utilization

Advancing Use of Recycled Material in Asphalt

Beneficial Use of Plastic Wastes

Biochar

Use in Agriculture

Biochar Use in Supercapacitors

Wood Biochar Use in Supercapacitors

Corn Cob Biochar Use in Supercapacitors

Testing Biochar's Capacitive Properties

Carbon Sequestration

Carbon Black Replacement

Biochar Use in Sensors

Bio-oils and Biolubricants

Clean Coal

Liquid Rubber Modifier in Asphalt Binders

Mud to Parks

Nano-CarboScavengers

Solar PV

Read about older waste utilization projects

Water Use and Reuse

Hazardous Waste Research Fund

### Meet the Scientists

- Nancy Holm
- Kishore Rajagopalan

### Presentations

- Biochar Supercapacitor Electrodes

### Publications

- **Highly ordered macroporous woody biochar with ultra-high carbon content as supercapacitor electrodes**

#### News Articles

- **Team uses forest waste to develop cheaper, greener supercapacitors**



One Hazelwood Drive, MC-676  
Champaign, IL 61820  
p: 217-333-8940  
[Email us](#)

#### Home of Illinois' State Scientific Surveys

Illinois Natural History Survey  
Illinois State Archaeological Survey  
Illinois State Geological Survey  
Illinois State Water Survey  
Illinois Sustainable Technology Center



Email the [Web Administrator](#) with questions or comments. For permissions information, [contact the Illinois Sustainable Technology Center](#).  
©2020 University of Illinois Board of Trustees. All rights reserved.

[Privacy statement](#) | [Intranet](#) | [Admin](#)