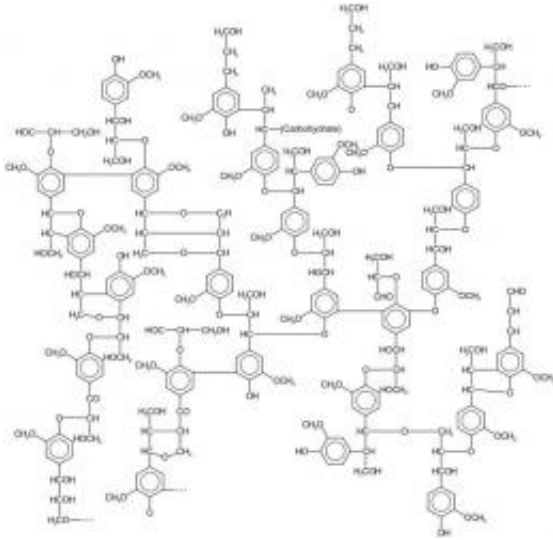


# Battery team gets a charge out of lignin

August 17 2012, by Nancy Owano

---



Lignin. Image: Wikipedia

(Phys.org) -- Creating energy from wood waste has progressed from novel idea to renewable energy work in development. Researchers from Poland and Sweden are using a waste product from the paper making process to develop a battery. That material is lignin. Olle Inganäs, professor of biomolecular and organic electronics at Linköping University in Sweden and Grzegorz Milczarek, a researcher at Poznań University of Technology in Poland, have completed a study that shows how it is done. They maintain that the insulating qualities of lignin derivatives can be combined with the conductivity of the polymer polypyrrole to create a composite material that effectively holds an electric charge.

Lignin acts as the insulator and polypyrrole as a conductor, holding an electric charge. Lignin is the substance found in plants, and it is stripped out of wood as a [waste product](#) during the paper-making process. In the researchers' paper, "[Renewable Cathode Materials from Biopolymer/Conjugated Polymer Interpenetrating Networks](#)" published in *Science*, the authors provide more details on lignin and their methods.

"Brown liquor, the waste product from paper processing, contains lignin derivatives. Polymer cathodes can be prepared by electrochemical oxidation of pyrrole to polypyrrole in solutions of lignin derivatives. The quinone group in lignin is used for electron and proton storage and exchange during redox cycling, thus combining charge storage in lignin and polypyrrole in an interpenetrating polypyrrole/lignin composite."

A clear advantage of their discovery would be in the ready availability of a natural material such as lignin as opposed to dependence on metal oxides such as those used in lithium-ion batteries. The researchers themselves, however, emphasize that their work needs further and extensive study; they recognize this is not at a stage for industrial-style development.

These rechargeable batteries are still limited, according to the researchers, because they slowly lose their [electric charge](#) as they sit idly. Milczarek and Inganäs also found that various lignin derivatives perform differently in the cathode, depending on how they are processed. With continued investigations, it may be possible to optimize the batteries. Another implication to a "wood" battery may be in cost, versus existing batteries, as there would not be a reliance on precious metals.

"The advantage of using a renewable material for charge storage is the enormous amount of this material that is already being produced on Earth by growing plants, which contain about 20 to 30 percent lignin," according to Inganäs. "It is also a low-value material, currently being

used for combustion. Lithium-ion batteries, on the other hand, require metal oxides and some of those [materials](#), such as cobalt, are rather rare."

According to the International [Lignin](#) Institute, after cellulose, it is the most abundant renewable carbon source on Earth. Between 40 and 50 million tons per annum are produced worldwide as a mostly non-commercialized waste product.

© 2012 Phys.org

Citation: Battery team gets a charge out of lignin (2012, August 17) retrieved 26 April 2024 from <https://phys.org/news/2012-08-battery-team-lignin.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.