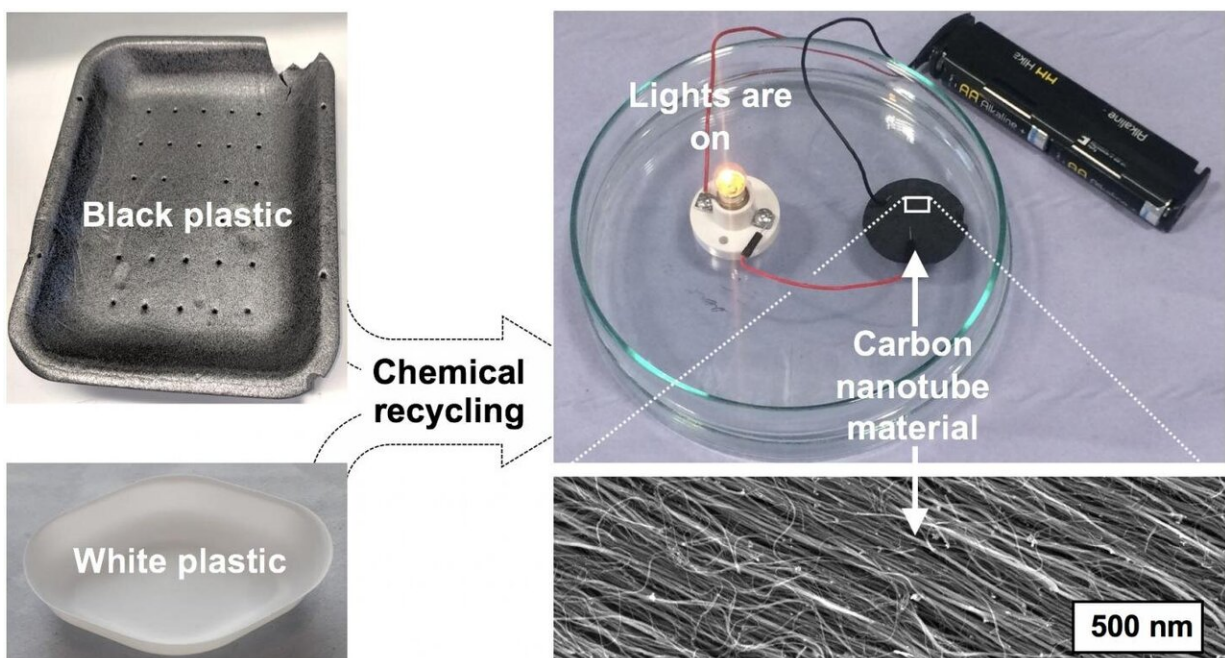


Research shows black plastics could create renewable energy

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Process by which plastics are converted to carbon nanotube material. Credit: Dr Alvin Orbaek White

Research from Swansea University has found how plastics commonly found in food packaging can be recycled to create new materials like wires for electricity—and could help to reduce the amount of plastic waste in the future.

While a small proportion of the hundreds of types of plastics can be recycled by conventional technology, researchers found that there are other things that can be done to reuse plastics after they've served their original purpose.

The research, published in *The Journal for Carbon Research*, focuses on chemical recycling which uses the constituent elements of the [plastic](#) to make new materials.

While all plastics are made of [carbon](#), hydrogen and sometimes oxygen, the amounts and arrangements of these three elements make each plastic unique. As plastics are very pure and highly refined chemicals, they can be broken down into these elements and then bonded in different arrangements to make high value materials such as carbon nanotubes.

Dr. Alvin Orbaek White, a Sêr Cymru II Fellow at the Energy Safety Research Institute (ESRI) at Swansea University said: "Carbon nanotubes are tiny molecules with incredible physical properties. The structure of a [carbon nanotube](#) looks a piece of chicken wire wrapped into a cylinder and when carbon is arranged like this it can conduct both heat and [electricity](#). These two different forms of energy are each very important to control and use in the right quantities, depending on your needs.

"Nanotubes can be used to make a huge range of things, such as conductive films for touchscreen displays, flexible electronics fabrics that create energy, antennas for 5G networks while NASA has used them to prevent [electric shocks](#) on the Juno spacecraft."

During the study, the research team tested plastics, in particular black plastics, which are commonly used as packaging for ready meals and fruit and vegetables in supermarkets, but can't be easily recycled. They removed the carbon and then constructed nanotube molecules from the

bottom up using the carbon atoms and used the nanotubes to transmit electricity to a light bulb in a small demonstrator model.

Now the research team plan to make high purity carbon electrical cables using waste plastic materials and to improve the nanotube material's electrical performance and increase the output, so they are ready for large-scale deployment in the next three years.

Dr. Orbaek White said: "The research is significant as carbon [nanotubes](#) can be used to solve the problem of electricity cables overheating and failing, which is responsible for about 8% of electricity is lost in transmission and distribution globally.

"This may not seem like much, but it is low because electricity cables are short, which means that power stations have to be close to the location where electricity is used, otherwise the energy is lost in transmission.

"Many long range cables, which are made of metals, can't operate at full capacity because they would overheat and melt. This presents a real problem for a renewable energy future using wind or solar, because the best sites are far from where people live."

More information: Ali Hedayati et al, Chemical Recycling of Consumer-Grade Black Plastic into Electrically Conductive Carbon Nanotubes, *C, The Journal for Carbon Research* (2019). [DOI: 10.3390/c5020032](#)

Provided by Swansea University

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