

Mobile phones can soon survive being dropped

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The reconstructed polymer (top) was found to conduct one thousand times better than the standard polymer (below) due to its fixed ladder-like structure. Credit: NWO

Dutch researcher Paulette Prins has demonstrated that plastic does not have to be a poorer conductor than present-day semiconductors. This opens up the way for a revolution in consumer electronics: mobile phones and MP3 players will soon survive being dropped.

Just imagine it. Consumer products that do not break if accidentally dropped, devices with flexible screens that can be rolled up, and

products becoming a lot cheaper. Up until now it was a mere pipe dream. The limiting factor is the chips in such devices. These need to conduct electricity and plastic chips fail to make the grade. Plastic conducts at least 1000 times less well than the current generation of semi-conductors.

Prins showed that specially developed plastic can conduct just as well as existing semiconductors.

Conduction occurs when charge moves through the material. Prins discovered that in plastics, the movement of charge was mainly hindered by the structure of the material. Plastic is built up from polymers, which consist of complex chains. The greatest hindrances for conduction were the ends of the chains, fractures in the chains, and the chaos in and along the chains.

A German group of researchers rebuilt the chains. They formed a polymer with a relatively fixed, ladder-like structure. Prins made clever use of this. This polymer was found to conduct 1000 times better than had previously been shown for plastics.

The combination of simulations and advanced techniques makes Prins' research unique. She bombarded the material with electrons from a particle accelerator, which enabled her to study the rapid reactions in the plastic to an accuracy of 100 microseconds.

Subsequently she determined the conductance of the polymers by measuring the microwave absorption. This avoided the need to use electrodes. Such electrodes often disrupt the measurement. Prins published some of her findings in the leading journal *Physical Review Letters*.

Prins' research was funded by NWO.

Source: NWO

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