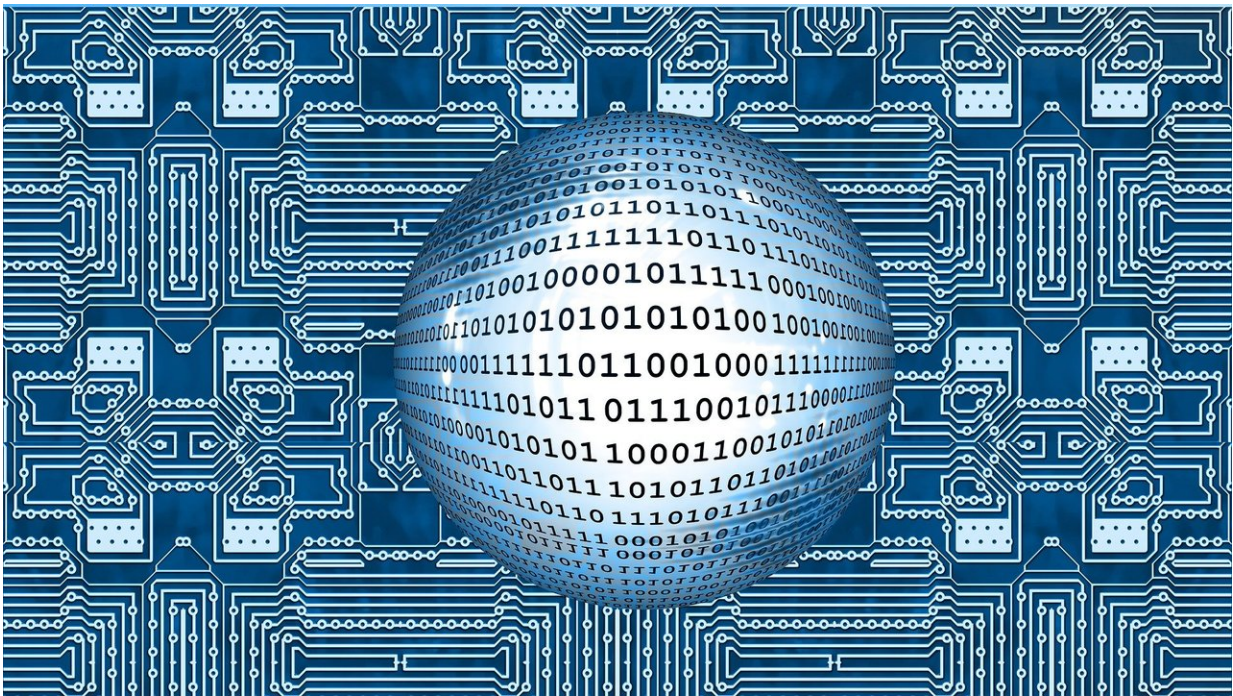


Plastic electronics: Ushering in the next generation of technology

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From cat's-whisker detectors in the early 1900s to electronic circuit chips in modern-day mobile phones, electronic devices have been modified in myriad creative ways to adapt to the needs of humankind. Apart from increasing the efficiency of conventionally used semiconductors such as silicon, recent research has focused on exploring more cost effective semiconductor materials. In tune with these

requirements, a new publication in *Nature Materials* has successfully tweaked low cost semiconducting materials, quite similar to the composition of plastic, into conducting electricity more efficiently than before.

Solar [cells](#) have the property to convert sunlight into electrical energy. This is a renewable source of energy and scientists have been trying to increase the efficiency of solar cells to maximize the utilization of the sunlight that we receive. While silicon has been a widely used [semiconductor material](#) in modern day solar cells, many research efforts have been directed towards experimenting with combinations of silicon with other materials to drive up the efficiency of a solar cell. Other endeavors include the use of novel materials that can be modified to convert sunlight into energy. One such class of materials that is being experimented with is similar to plastic. Though these materials give more room for tuning their structure and function, they have still not been able to rival existing silicon based [semiconductor devices](#) when it comes to efficiency.

In this study, the researchers attempt to increase the conductivity of this plastic material with the help of two inexpensive and easily available chemicals: dimethyl sulphoxide (DMSO) and hydrobromic acid (HBr). As a result of the chemical reactions in the [semiconductor](#) material, one of the by-products formed is water, thus making this reaction quite clean. Also, the components of this set-up are easily available and inexpensive, thus making it commercially viable. The cost of this material is 5000 times less than the existing class of material used for the same purpose.

The researchers involved in this study, led by Pabitra Nayak from the Tata Institute of Fundamental Research, Hyderabad, observed that this new semiconductor device steadily conducts electricity even after prolonged operation at 100°C. The researchers have demonstrated the

use of this method in fabricating the state-of-the-art new generation solar cell, transistors and light emitters. While this new method holds promise for developing the next generation of [solar cells](#), it can also improve the quality of display in mobile phones and high definition television. Apart from these uses, this material may potentially become a game changer in developing devices such as wearable electronics, biosensors and bioelectronics.

While the reported chemical partnership is good news, this study also opens up multiple avenues for exploring how one may resort to creating more efficient semiconductors with a right mix of compatible chemicals to further improve the existing class of [electronic devices](#).

More information: Nobuya Sakai et al, Adduct-based p-doping of organic semiconductors, *Nature Materials* (2021). [DOI: 10.1038/s41563-021-00980-x](#)

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