Full control of plastic transistors

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In an article in the highly ranked interdisciplinary journal *PNAS*, Loïg Kergoat, a researcher at Linköping University, describes how transistors made of plastic can be controlled with great precision.

The Organic Electronics Research Group at Linköping University (LiU) in Sweden, led by Professor Magnus Berggren, attracted great attention a year ago when Lars Herlogsson showed in his doctoral thesis that it was possible to construct fully functional field-effect transistors out of plastic.

Kergoat, a post-doc in the same research group, now shows that transistors made of plastic can be controlled with great precision.

If a transistor is to be usable in a logic circuit, the threshold voltage, where the transistor switches from off to on, or zero to one, must be well defined. Kergoat has now shown that by changing the material on the gate electrode, the electrode in a transistor that governs the current through both the other electrodes, the threshold voltage can also gradually be shifted.

"Transistors built from organic electronics need to be able to be controlled with weak voltages, preferably as close to zero as possible," Kergoat says.

By changing the electrode material, for example from gold to calcium, the threshold voltage is reduced by as much as 0.9V.

"This means that we can control exactly one of the most important properties of our transistors, which is of great significance now that we're building circuits of various types," Berggren says.

Research was conducted in collaboration between the Organic Electronics Group in the Linköping University Department of Science and Technology and a research group at the Université Paris Diderot, Paris 7, where Berggren was a guest professor between 2009 and 2011.

More information: "Tuning the Threshold Voltage in Electrolyte-Gated Organic Field-Effect Transistors", *Proceedings of the National Academy of Sciences*, online May 14, 2012, doi: 10.1073/pnas.1120311109

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