10-minute plasma treatment improves organic memory performance

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In its current early stage of development, digital memory circuits that use organic elements instead of silicon or other inorganic materials have a seemingly endless list of variables and options to consider, test, and optimize. While organic electronics are immediately attractive for their potential for extremely low cost and flexible substrates, many design aspects that are now taken for granted in the mature silicon-circuit world must be examined anew from the ground up.

A group led by Takhee Lee from Korea's Gwangju Institute of Science and Technology has demonstrated an optimal combination of materials and processing for a resistive memory circuit design. With a specific composite polymer located between two aluminum contacts as their on-off memory element, the scientists showed that exposing the contacts to an oxygen plasma for a mere 10 minutes prior to constructing the memory cell improved the ratio of on-to-off signal more than 10-fold, to more than 10,000. A larger ratio enables higher circuit performance.

"This simple plasma treatment is very cost-effective compared with alternatives, and improved the operation enough to enable high-performance memory devices, " said Byungjin Cho, lead author of the technical report that appeared in August 16 edition of Applied Physics Letters, which is published by the American Institute of Physics. In addition to the on/off ratio, Cho added that other qualities such as switching speed and endurance, data retention and environmental durability must also be investigated and improved before organic memory chips would become practical. Different organic materials may

also require their own solutions as well, he added.

More information: The article, "Electrical characterization of organic resistive memory with interfacial oxide layers formed by O2 plasma treatment" by Byungjin Cho, Sunghoon Song, Yongsung Ji and Takhee Lee is published in the journal *Applied Physics Letters*. See: link.aip.org/link/applab/v97/i6/p063305/s1

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