Light makes write for DNA information-storage device

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Researchers have demonstrated a write-once-read-many-times information-storage device, made of DNA embedded with silver nanoparticles, that uses ultraviolet light to encode data.

In an effort to make data storage more cost-effective, a group of researchers from National Tsing Hua University in Taiwan and the Karlsruhe Institute of Technology in Germany have created a DNA-based memory device that is "write-once-read-many-times" (WORM), and that uses ultraviolet (UV) light to make it possible to encode information.

The device, described in a paper accepted to the AIP's Applied Physics Letters, consists of a thin film of salmon DNA that has been embedded with silver nanoparticles and then sandwiched between two electrodes. Shining UV light on the system enables a light-triggered synthesis process that causes the silver atoms to cluster into nano-sized particles, and readies the system for data encoding. In some cases, using DNA may be less expensive to process into memory devices than using traditional, inorganic materials like silicon, the researchers say.

At first, when no voltage or low voltage is applied through the electrodes to the UV-irradiated DNA, only a low current is able to pass through the composite; this corresponds to the "off" state of the device. But the UV irradiation makes the composite unable to hold charge under a high electric field, so when the applied voltage exceeds a certain threshold, an increased amount of charge is able to pass through. This higher state of

conductivity corresponds to the "on" state of the device.

The team found that this change from low conductivity ("off") to high conductivity ("on") was irreversible: once the system had been turned on, it stayed on, no matter what voltage the team applied to the system. And once information is written, the device appears to retain that information indefinitely: the researchers report that the material's conductivity did not change significantly during nearly 30 hours of tracking. The authors hope the technique will be useful in the design of optical storage devices and suggest that it may have plasmonic applications as well.

More information: "Photoinduced write-once read-many-times memory device based on DNA biopolymer nanocomposite" is published in *Applied Physics Letters.*

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