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Science

NEWS SCIENCE NEWS 'Cry More': Scientists Devise A Smart Contact Lens...

'Cry more': Scientists devise a smart contact lens powered by human tears

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According to a press release from Nanyang Technological University (NTU) in Singapore, researchers there have developed an incredibly thin battery, just a few micrometers in size, which has the unique ability to power smart contact lenses and can be charged using tears, reported Interesting Engineering. The team, led by Lee Seok Woo, an assistant professor at NTU's School of Electrical and Electronic Engineering (EEE), has come up with a battery that eliminates the use of metals.

Traditionally, contact lenses have been utilized for vision correction, but as technology has advanced, efforts have been directed towards creating smarter iterations that can connect to devices like smartphones and display information right in front of the wearer's eyes. This kind of functionality necessitates the integration of an internal battery within the lenses.

Previously, augmented reality displays on smart contact lenses were achieved using exceptionally thin batteries equipped with induction coils and metal wires. However, these posed potential risks to the user's eyes. The NTU research team has tackled this challenge by designing a battery composed of biocompatible materials, coated with a glucose-based substance. This coating interacts with sodium and chloride ions present in the battery's internal water content, effectively creating circuitry to generate electricity. Importantly, since sodium and chloride ions are also found in tears, the lenses could theoretically be charged naturally as the user wears them.

Lee Seok Woo explained, "This research began with a simple question: Could contact lens batteries be recharged with our tears? Previous techniques for lens batteries were not perfect as one side of the battery electrode was charged and the other was not. Our approach can charge both electrodes of a battery through a unique combination of enzymatic reaction and self-reduction reaction." The glucose and water used in the process are environmentally safe and pose no harm to the user.

Despite the battery's incredibly small size, just a fraction of a millimeter thick, questions remain about its energy capacity and lifespan. To address this, the researchers conducted experiments using a simulated eye model. Results showed that the battery can produce a current of 45 microamperes and a maximum power output of 201 microwatts, sufficient to power the device for most of the day.

The innovative charging mechanism involving tears plays a vital role. Placing the battery in a simulated tear solution can extend its life by an additional hour for every twelve hours of use. During periods of non-use, the battery can be stored in a concentrated saline solution containing high levels of glucose, potassium, and sodium ions, facilitating charging.

The research team verified that the battery can undergo 200 charge-discharge cycles, demonstrating its durability. Li Zongkang, a Ph.D. student at NTU involved in the project, noted, "By combining the battery and biofuel cell into a single component, the battery can charge itself without the need for additional space for wired or wireless components. Furthermore, the electrodes placed at the outer side of the contact lens ensures that the vision of the eye cannot be obstructed."

Currently, the team is focused on enhancing the battery's discharge capacity and collaborating with contact lens companies to bring this groundbreaking technology to the market.