Today's solar cells are mainly used for large-scale power production. However, the up-and-coming internet of things (IoT) will require many sensors and devices to transmit information wirelessly to computer networks and mobile personal electronics. Those sensors and devices could be powered with solar cells that harvest energy from either freely available sunlight or indoor lighting, provided the solar cells are small, inexpensive, lightweight, and able to conform and adhere to surfaces with any shape or texture.

To address the need for a new type of solar cell, an interdisciplinary team of chemical engineers, botanists, and artists is developing a paper solar cell technology that can be mounted on nearly any surface. reported for devices fabricated directly

their performance when bent or even folded and unfolded multiple times across the active area of the device.

The solar cell technology involves a combination of nanocellulose paper cultivated by bacteria and a semiconducting nanocrystal ink. A scalable process harnesses the bacterium *Gluconacetobacter hansenii* to produce dense nanocellulose membranes that are processed into paper. The nanoporous structure of the paper enables exceptional adhesion of the device layers and mitigates the impact of bending stresses that typically cause these brittle layers to crack.

The semiconducting (light-harvesting) layer is also critical

integrity of the overall paper device. It prevents crack propagation on the nanocellulose paper and stabilizes the entire device stack when it is bent or folded. The researchers produce

depositing an ink of colloidal nanocrystals composed of copper-indium-diselenide ($CuInSe_2$) onto the paper substrate. The nanocrystals are made via readily available solution-based chemical processes and materials. The