

# Recyclable Organic Solar Cells On Substrates Comprising Cellulose Nanocrystals (CNC)

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## **The process of harvesting solar energy can limit its efficiencies**

Sunlight is one of the most abundant natural and renewable sources of energy available; however, the way we produce the technology to harvest it can be expensive and damaging to the environment. Traditional silicon-based solar cells are expensive to produce due to the extensive process required to refine and process the material. This process in itself is not environmentally friendly, as it requires a significant amount of energy and resources. Additionally, once the material is configured into panels, they are rigid, limiting their ability to be integrated into a variety of structures. The panels are also fragile and brittle, which impacts their handling, transportation, deployment and installation, durability, and longevity. Furthermore, their recycling and disposing at the end-of-life cycle can be expensive and environmentally harmful.

## **Innovation reduces environmental impacts, costs, and compatibility issues**

Researchers at the Georgia Institute of Technology employed cellulose nanomaterials to develop novel photovoltaic devices that are an alternative to existing technologies. This technology will reduce environmental impact, provide a sustainable solution for energy production, and solve the challenge of integrating solar cells into various applications due to the flexibility, low cost, abundance, and light weight of CNC substrates.

## **Summary Bullets**

- The novel invention utilizes cellulose nanocrystals to create efficient organic solar cells with substrates that are renewable and exhibit strong mechanical and optical properties, achieving a high power conversion efficiency.
- The solution offers an environmentally friendly alternative to traditional silicon-based solar panels by being flexible, low-cost, biodegradable, and easily recyclable at room temperature.
- The innovation is suitable for commercial uses in low-cost electronics, biodegradable printed electronics, wearables, IoT applications, and sustainable building designs.

Solution Advantages

- Solar cells are recyclable through a low-energy, room temperature process.
- CNC substrates are made from renewable sources are abundant, low-cost, and fully biodegradable.
- Exhibit ideal optical properties with high transparency and low roughness.
- Demonstrate superior mechanical properties, enhancing durability and performance.
- Compatible with existing organic semiconductor processing techniques, allowing for up to 350°C processing temperatures.

### Potential Commercial Applications

- Low-cost, lightweight, and flexible power supplies for consumer electronics and home appliances.
- Short-lived, disposable, or biodegradable power sources for low-cost printed electronics and architecture.
- Renewable energy solutions for wearables and Internet of Things (IoT) sensor applications.
- Applications in conjunction with textiles and garments, wearable electronics.
- Building-Integrated Photovoltaics (BIPV) for sustainable construction and design.

### Inventors

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### IP Status

<p>Patent has issued</p>: US9203030B2

### Publications

[Recyclable organic solar cells on cellulose nanocrystal substrates](#), Nature, Scientific Reports - 2013

### Images

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