



## Stretchable Transistors Using Carbon Nanotube Film

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**WARF: P130386US01**

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**The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a simplified method of fabricating highly bendable transistors that could enable a new generation of electronics.**

### Overview

Stretchable electronics have many potential applications such as implantable biosensors, wearable devices and flexible displays. Yet critical components like transistors are still based on silicon. Efforts to utilize other semiconductor materials have met with mixed success. Carbon nanotubes are considered a strong candidate to replace or supplement silicon.

### The Invention

UW-Madison researchers have developed a method of fabricating stretchable transistors with buckled carbon nanotube film as the conductive channel. The new process is much simpler than existing techniques and does not involve complicated lithography.

First, a thin film of single-walled carbon nanotubes (SWCNTs) is applied onto the surface of an elastic substrate, then repeatedly stretched and relaxed, causing the film to buckle. Layers of electrically conducting material are then deposited to form source and drain electrodes. Finally, a stretchable material such as ion gel is deposited to form a gate dielectric between the two electrodes.

### Applications

- Transistors for high performance stretchable electronics (e.g., stretchable displays, organic LEDs)

### Key Benefits

- New transistors can be stretched up to 50 percent without harming performance.
- Twice the stretch of competing designs
- Simple method requires no complicated lithography.

### Stage of Development

The researchers have successfully fabricated highly stretchable transistors using their new method. The resulting devices exhibit an excellent on/off ratio and low operating voltage. Performance remains stable even under major tensile strain.

The development of this technology was supported by WARF Accelerator. WARF Accelerator selects WARF's most commercially promising technologies and provides expert assistance and funding to enable achievement of commercially significant milestones. WARF believes that these technologies are especially attractive opportunities for licensing.

### Additional Information

#### For More Information About the Inventors

- [Michael Arnold](#)

**Related Technologies**

- [WARF reference number P99038US describes a method for carbon nanotube production.](#)

**Publications**

- Xu F., Wu M.-Y., Safron N.S., Roy S.S., Jacobberger R.M., Bindl D.J., Seo J.-H., Chang T.-H., Ma Z. and Arnold M.S. 2014. Highly Stretchable Carbon Nanotube Transistors with Ion Gel Gate Dielectrics. Nano Lett. 14, 682–686.

**Tech Fields**

- [Semiconductors & Integrated Circuits : Components & materials](#)

For current licensing status, please contact Jeanine Burmania at [jeanine@warf.org](mailto:jeanine@warf.org) or 608-960-9846