

Laser-based Fabrication of Metal Nanocomposites on Flexible Substrates

A new laser-based process creates durable carbon nanotube–metal composite thin films on flexible substrates, eliminating the need for expensive masks or vacuum fabrication, and enhancing the reliability of flexible electronic devices.

Flexible electronics have many advantages including providing weight savings, good portability, and ease of integration with other devices. They have many current or potential applications. Unfortunately, these devices are often subject to repeated strain and stresses, which could lead to cracks and fatigue failures in their metallic components. Thus, it is highly desirable to enhance the reliability and durability of metal components in flexible electronics.

A Purdue University researcher has invented a laser-based process for fabricating carbon nanotube (CNT)-metal nanocomposite thin films onto flexible substrates. This technology eliminates the need for costly masks or vacuum during the fabrication process and is potentially suitable with a variety of metals including silver and copper. Replacing the conventional metal components in flexible electronics with the laser-fabricated metal nanocomposites can potentially enhance the device durability and reliability via the CNT-induced fatigue property improvement.

Potential Advantages:

- The nanocomposite thin film can have enhanced fatigue performance
- The nanocomposite fabrication does not need costly masks or vacuum
- The geometry of the fabricated nanocomposite thin film can be flexibly adjusted
- Laser can be focused to a small spot to provide a high spatial resolution in fabrication

Potential Applications:

Technology ID

2017-WU-67660

Category

Semiconductors/Fabrication &
Process Technologies
Materials Science &
Nanotechnology/Nanomaterials
& Nanostructures
Materials Science &
Nanotechnology/Advanced
Functional Materials

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-Flexible electronic devices that involve metal thin films on flexible substrates

-Sensors

-Wearable electronics

-Solar cells

-Flexible displays

Related Publications:

Kang, Z., Wu, B., Wang, R., and Wu, W. (June 28, 2018). "Laser-Based Fabrication of Carbon Nanotube-Silver Composites With Enhanced Fatigue Performance Onto a Flexible Substrate." ASME. J. Manuf. Sci. Eng. September 2018; 140(9): 091005. <https://doi.org/10.1115/1.4039492>

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