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Author: Phong Tran Hoang Tao Liu

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# Diazonium Salt Treated Single-Walled Carbon Nanotube Thin Films with High Piezoresistive Sensitivity

Phong Tran Hoang and Tao Liu\*

High-Performance Materials Institute

Florida State University

2005 Levy Ave., Tallahassee, FL 32310, United States

\*Corresponding author. Tel: 850 410-6606. Fax: 850 410-6342. E-mail: liutao@eng.fsu.edu (Tao Liu)

## Highlight:

- A simple method relying on diazonium chemistry is disclosed to increase the sensitivity of SWCNT thin films based strain sensor by ~264%.
- Crosslinks formed between SWCNTs caused by the free radical reaction enhance the load transfer efficiency and the gauge factor of SWCNT thin film based strain sensors
- The crosslinking mechanism responsible for the significantly improved gauge sensitivity is supported by a coupled mechanical-stretching and Raman scattering study.

## Abstract

Due to a lack of efficient load transfer, the Single-Walled Carbon Nanotube (SWCNT) thin film based piezoresistive sensor typically has a low sensitivity. In this study, a simple method that involves diazonium salt treatment of a pristine SWCNT thin film was developed to enhance the load transfer efficiency of SWCNTs. As compared to the pristine thin film sensor, the gauge factor of the diazonium salt treated SWCNT thin films exhibited a ~264% increase. Spectroscopy, microscopy, and in particular, the coupled mechanical-stretching and Raman scattering characterizations were performed to understand the diazonium salt treatment induced piezoresistivity enhancement of SWCNT thin films.

**Keywords:** Single-Walled Carbon Nanotube, piezoresistive sensors, Diazonium salt, Raman spectroscopy, crosslinkages

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