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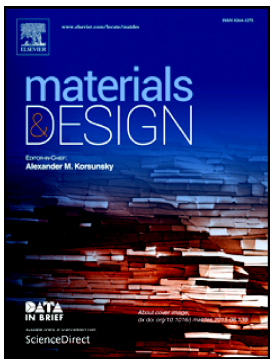

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Hamid Souri, Debes Bhattacharyya

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Wearable Strain Sensors Based on Electrically Conductive Natural Fiber Yarns

Hamid Souri[1*] and Debes Bhattacharyya[1]

[1] Centre for Advanced Composite Materials, Department of Mechanical Engineering, The University of Auckland, Auckland, New Zealand, 1142.

Abstract

The demand for flexible and wearable devices based on novel nanomaterials is rapidly growing due to their applications in human motion detection, soft robotics, human-machine interface and similar applications. Herein, we report a systematic study on the fabrication of electrically conductive yarns made of natural fiber yarns coated with graphene nanoplatelets (GNPs) and carbon black (CB). The highly conductive yarns are then utilized to fabricate wearable, stretchable, and durable strain sensors. Our strain sensors demonstrate a good sensitivity with gauge factors (GFs) in the range of 1.46 to 5.62, depending on the magnitude of the applied strain and displacement rate. The strain sensors show reliable electromechanical response to strains as large as 60%, suggesting their potential application in human motion detection. They can successfully detect a range of human movements, such as finger, wrist, and knee joint movements, pronunciation, breathing, and swallowing. Finally, we propose a flexible grid structured pressure sensor to detect finger touch that could be utilized as flexible touch panels.

Keywords: flexible strain sensor; wearable sensor; conductive natural fiber yarns; graphene nanoplatelets; human motion detection

S: Supporting information

*Correspondence author's Email:*hsou970@aucklanduni.ac.nz