Lightweight, Low Energy Consumption Heaters for Winter Gears

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With global warming, hotter summers and harsher winters are increasing yearly. There are some outdoor workers that are indispensable to their communities, however their safety and effectiveness has been compromised due to lack of proper technologies to protect them from the cold weather. Fortunately, the never ending search for new and more efficient materials has led to the discovery of carbon nanotubes (CNTs) as a heating material. They are excellent thermal and electrical conductors and these attributes make them useful as a good source of heating material. They also have high heating rates and have been shown to be more effective than some commercial heating materials such as nichrome. This project proposes the design and assembly of nanomaterials that are ideal for heating applications and their incorporation into fabrics. Due to the unique physical properties of CNTs, the heaters will have low power consumption, be light weight, have complete mechanical flexibility, and have fast heating rates Heating components manufactured from CNTs are extremely light weight, the density of these materials is close to 1 g/cc, almost 1/10 of Copper based heating components with density of ~8g/cc.

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University of Cincinnati
16th Annual
Pilot Research Project
Symposium
October 8-9, 2015

Hosted by: The University of Cincinnati Education and Research Center
Supported by: The National Institute for Occupational Safety and Health. (NIOSH) Grant #: T42-OH008432

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Produced by Kurt Roberts Department of Environmental Health