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Smart textiles based on carbon nanotubes

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Abstract

The dream to incorporate functionality into textiles has inspired tremendous efforts to produce smart textiles, which may find their applications in sportswear, foldable display, portable power, healthcare, military and work wear etc. Owing to their unique properties, carbon nanotubes have recently been used to functionalize conventional textiles and endow textiles with new function. By a dipping-drying procedure, in this work, nylon and cotton were functionalized with organic dye dispersed carbon nanotubes through the operation of Van der Waal's forces, hydrogen bindings and ionic bondings. The attachment of carbon nanotubes onto fabrics were suggested by Raman microscopy, scanning electron microscopy and transmission electron microscopy. These functionalized fabrics can be curved and knotted randomly, demonstrating good flexibility of the fabrics. When the functionalized fabrics were treated with solvents, heat, or a combination of both, no obvious nanotube dissociation and precipitation was observed, reflecting the robust interactions between nanotubes and fabrics. The obtained nylon was used to make a capacitor structure, which possesses the merits of light weight, little hysteresis, and low power dissipation. The resultant cotton was used to make chemiresistors, which shows reasonable response to ammonia gas. All the structures can be easily integrated into clothing to make wearable electronics and intelligent textiles.

Biography

Zhang joined Department of Engineering Mechanics in Dalian University of Technology (China) in 2011. He worked a Research Fellow at Advanced Technology Institute in The University of Surrey (UK) and had been a member of the research faculty since 2008 after he received a PhD degree in Materials Science in The University of Leeds (UK). His research interest includes smart textiles, nano composites, and dyeing and finishing. His research work has results in over 50 journal and conference papers. He was the Chair of Chinese Textile & Apparel Society-U.K. (2008-2010).