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Fibre structures for energy harvesting in wearables

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The piezoelectric effect in Poly (vinylidene fluoride), PVDF, has been utilised in the development of fibres and their integration into fabric structures for energy harvesting. A "3D spacer" technology based all-fibre piezoelectric fabrics as power generators and energy harvesters are presented. The knitted single-structure piezoelectric generator consists of high β-phase (~80%) piezoelectric PVDF monofilaments as the spacer yarn interconnected between silver (Ag) coated polyamide 66 multifilament yarn layers acting as electrodes. The novel and unique textile structure provides an output power density in the range of 1.10 - 5.10 μWcm-2 at applied impact pressures in the range of 0.02 - 0.10 MPa, providing significantly higher power outputs and efficiencies over the existing 2D woven and nonwoven piezoelectric structures. The method of producing high quality piezoelectric yarn and piezoelectric fabric provides an effective option for the development of high performance energy-harvesting textile structures for electronic devices that could be charged from ambient environment or by human movement. Furthermore, via the creation of hybrid photovoltaic films and fibres, energy can be captured from solar radiation and used where the mechanical impetus is absent. The high energy efficiency, mechanical durability and comfort of the soft, flexible and all-fibre based power generator is highly attractive for a variety of potential applications such as wearable electronic systems and energy harvesters charged from ambient environment or by human movement.

Biography

Elias Siores has completed his PhD from Brunel University, UK and MBA from Wollongong University, Australia. He is the Provost, Research and Development, Bolton University, UK. He is researching in the area of smart materials for renewable energy and biomedical devices applications and has published more than 300 papers in international journals, holder of 5 international patents and recipient of 15 international awards.

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