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## Fibre structures for energy harvesting in wearables

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 is the Provost and Director of Research and Innovation, Bolton University. Educated in the UK (BSc, MSC, MBA, PhD) and pursued his academic career in Australia (Sydney, Brisbane and Melbourne) and Asia (Hong Kong, Dong Guan) before returning to Europe (UK) as a Marie Curie Fellow. He is also President, Board of Governors, TEI – Athens and Director of Innovation, FibrLec Ltd. His R&D work concentrated on advancing the science and technology in the field of automated Non-Destructive Testing and Evaluation including Ultrasound, Acoustic Emission, and Microwave Thermography. His recent R&D work focuses on Smart / Functional Materials and Systems development. In this area, he has developed Electromagnetic, Electro rheological, Photovoltaic and Piezoelectric Smart Materials based Energy Conversion Systems for Renewable Energy, Medical, Health Care and Wearable Devices. He has published over 300 publications including 8 Patents. He has been a member of editorial boards of international journals and a Fellow of IOM, TWI, IEAust, SAE and WTIA. He has served on Board of Directors of a number of research centres worldwide including UK, Australia, Singapore and Hong Kong, all associated with the Bio-Nano-Materials field. He is a member of the Parliamentary Scientific Committee and has received 15 international awards in his career for R&D and innovation achievements.

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