

## Research Profile



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**Position:** Senior Research Fellow

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### SUMMARY OF MY RELEVANT RESEARCH AREAS AND EXPERTISES:

Printed electronics, intelligent textiles, wearable medical devices, fabric electrode, ink formulations, printing technologies, stroke rehabilitation, functional electrical stimulation; multidisciplinary project management; enterprise/commercialization; public engagement.

印刷电子，智能纺织品，可穿戴医疗器械，纺织品电极，墨水配方，打印技术，中风康复，电子功能刺激；多学科合作项目管理；科研成果产业化；公众参与。

#### Primary Research interests:

I have been worked on electronic textiles for 7 years with focus on the e-textile material development and fabrication for medical and healthcare applications. My primary research interests include:

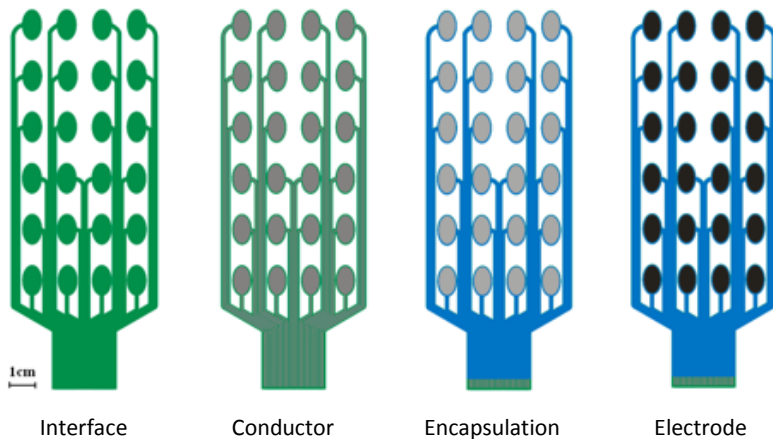
- **Wearable healthcare/medical devices.** I am currently leading a £1.1 million 30 month Medical Research Council (MRC) project on 'Low-cost personalised instrumented clothing with integrated FES electrodes for upper limb rehabilitation'. This project is to bring together a multidisciplinary team's expertise in functional materials, direct printing fabrication, control algorithm, wireless electronics, sensor, and end user engagement to develop a personalised wearable Functional Electrical Stimulation (FES) training system for home based stroke upper limb rehabilitation. The success of this project will lead to the application of future funding for the clinical trials and commercialisation of the technology. The platform technologies developed in this project can also treat hand/arm disabilities resulting from other neurological conditions such as head injury, spinal cord injury, and multiple sclerosis.
- **Ink formulations for intelligent e-textiles.** I have developed a range of state-of-the-art inks (e.g. interface, encapsulation, piezoelectric, electrode) for printing electronics directly on everyday clothing fabrics. This forms the key IP of the university spin-out company Smart Fabric Inks Ltd. I am the lead inventor for the 'Electrodes' patent (patent number: 1608691.0. filed in May 2016). The fabric electrode is a platform technology that can be used in many wearable applications (e.g. muscle stimulation for fitness, gaming and healthcare/medical).
- **Others: additive manufacturing (e.g. screen printing, dispenser printing), biocompatible material development, electrode design and integration.**

#### Topics in which you would like to develop collaboration:

1. Application development for novel inks, for example, fabric electrode for pain relief, health monitoring, and rehabilitation.
2. Wearable technologies for healthcare/medical applications.
3. Collaboration on grants: Research (e.g. Global Challenges Research Fund); Network; Enterprise.
4. Enterprise and commercialisation.

**Relevant existing collaborations (academic/clinical/commercial) inside or outside China.**

- **Companies:** Odstock Medical Limited, Morgan IAT, Lenzing, Source23.
- **Universities:** University College London (UCL), Nottingham University, Loughborough University, University of Dundee, Nottingham Trent University.
- **Others:** Stroke Association, different Strokes, UCL hospitals, Southampton Science Park, Academic Health Science Network (AHSN), Knowledge Transfer Network (KTN), SETsquared Partnership.

**Relevant graphics, figures, pictures:****Figure 1.** Fabric electrode array printing processing**Figure 2.** Fabric electrode array**Figure 3.** FES training system for stroke upper limb rehabilitation**Figure 4.** Printed Electronics and Materials Lab**Publications and other outputs relevant to your interest in this programme (up to 5)**

1. Patent: Electrodes, Lead inventor: K. Yang, Patent number: 1608691.0. Filed on 17 May 2016.
2. C. Freeman, K, Yang, J. Tudor, and M. Kutlu, Feedback Control of Electrical Stimulation Electrode Arrays. *Medical Engineering & Physics*, 38 (1), 1185-1194, 2016.
3. K. Yang, C.T. Freeman, R.N. Torah, S. Beeby, and J. Tudor. Screen Printed Fabric Electrode Array for Wearable Functional Electrical Stimulation. *Sensors and Actuators A: Physical*, 213, 108-115, 2014.
4. K. Yang, R. Torah, Y. Wei, S. Beeby, and J. Tudor. Waterproof and durable screen printed silver conductive tracks on textiles. *Textile Research Journal*, 83, (19), 2023-2031, 2013.
5. Sky News <http://news.sky.com/story/1698862/swipe-dancing-robots-and-mind-games> and [www.youtube.com/watch?v=bytlFhQgsrY](http://www.youtube.com/watch?v=bytlFhQgsrY) (Accessed on 31/10/2016).