

*School of Engineering*  
*University of Bolton UK*

*Brian Klaveness*

*BA MSc MIEE, MET*

*Lecturer in Electronics*

School of  
Engineering



# About Me

- *Over 30 years experience in HE*
- *6 months at University of Bolton*
- *29 years at Wrexham(Glyndwr University)*
- *12 years managing German co-operation*
- *Assisted 1,200 Germany students get their degrees*

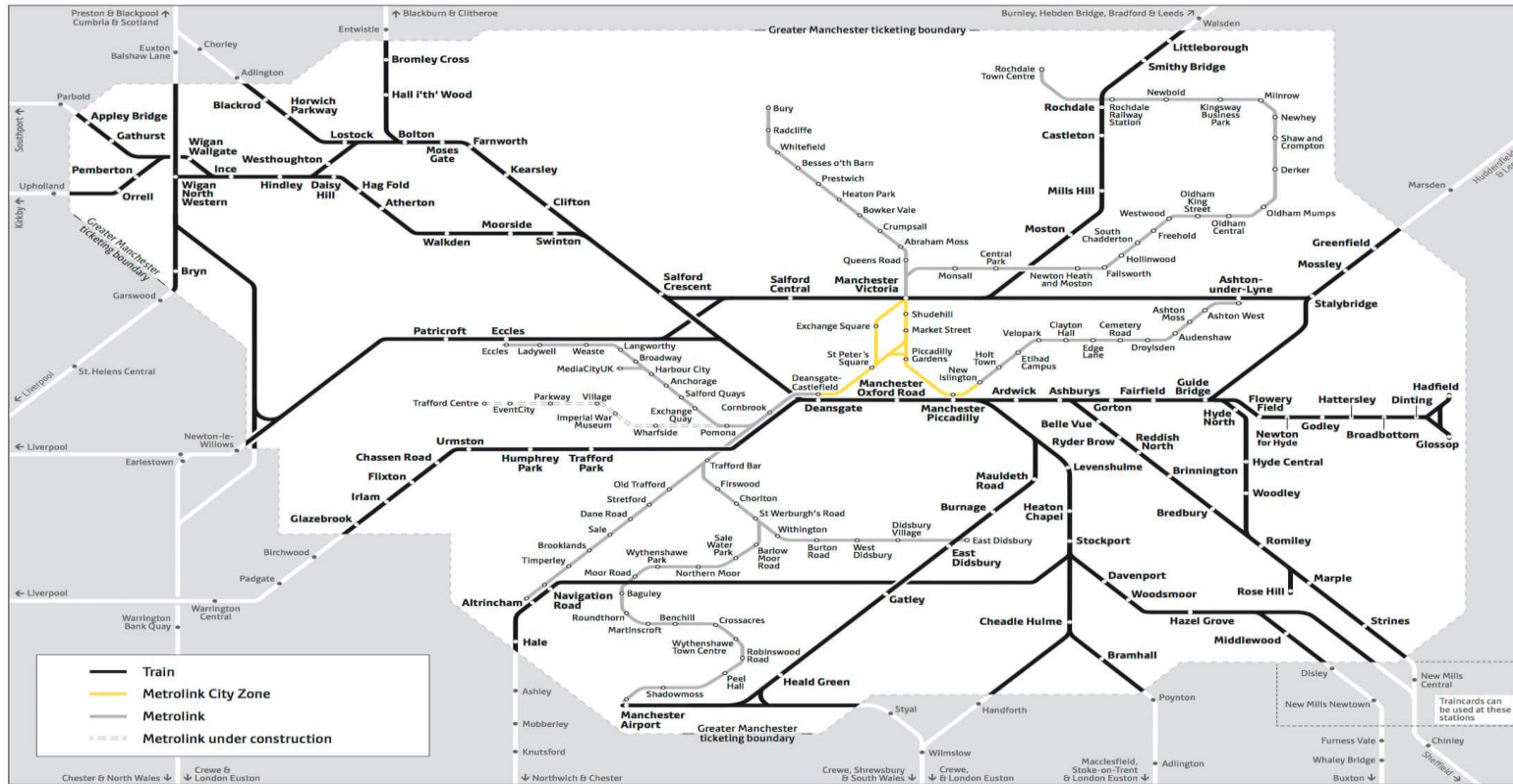
# Bolton - Greater Manchester



# Bolton Surrounding Area



# Transport



# Travelling from Bolton

- *Manchester-22km, 30 mins by train, cost c£3.00 return*
- *Manchester Airport-35km, 40 mins by train, cost c£4.00 return*
- *Liverpool - 60km, 1hr by train, cost c£8.00 return*
- *London - 350km, 2.5 hr by train. Cost c£50.00 return*
- *Lake District & Dales - 60km*

# *The University of Bolton*



# *The University of Bolton*





# *University - Institute of Management*



# *University Halls*



# Bolton ONE - Health Centre & Sports



# *University of Bolton - New Headquarters*



# £40m Student Village Development



# *Bolton Countryside*



# The University of Bolton Football Stadium - Bolton Wanderers



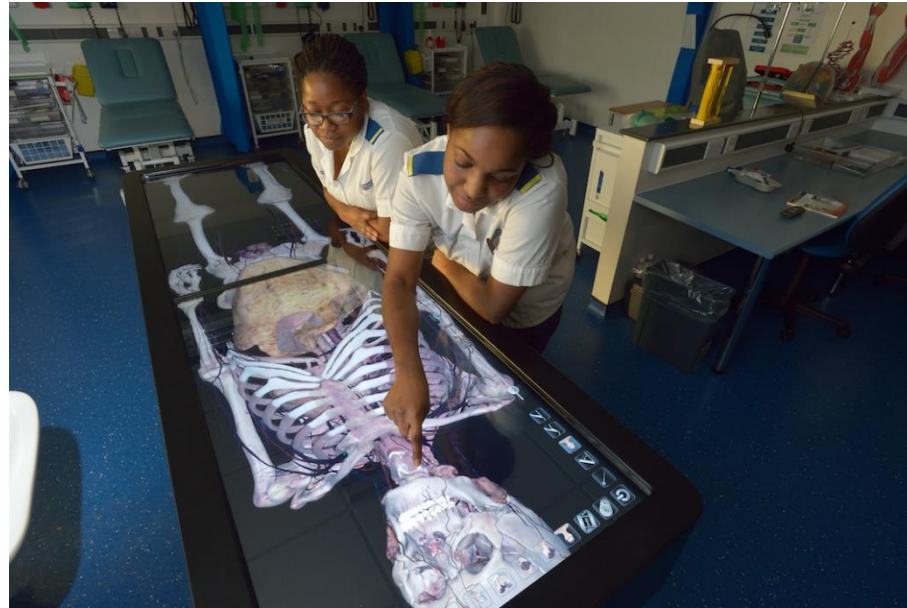
# The University [www.Bolton.ac.uk](http://www.Bolton.ac.uk)

*Circa - 8000 students. Located on 3 campuses in Bolton*  
**Schools/Faculties**

- *School of Engineering, including National Centre for Motorsport Engineering*
- *Arts*
- *Creative Technologies*
- *Law*
- *Sport & Biological Sciences*
- *Institute of Management*
- *Faculty of Health & Wellbeing = Nursing Dental Technology*
- *Education*
- *Psychology*
  
- *Off\_Campus locations throughout the world - e.g. Malawi, Zambia, Sri-Lanka, Ras Al-Khaimah, Shanghai, Kuala Lumpur, Athens, Prague, South Westphalia etc.*



# *Strong Performance For University Of Bolton In National Student Survey (NSS)*



<https://www.bolton.ac.uk/strong-performance-for-university-of-bolton-in-national-student-survey-nss/>

# *University Of Bolton Storms Up Whatuni\* National League Table, And Takes First Place In Greater Manchester*



<https://www.bolton.ac.uk/university-of-bolton-storms-up-whatuni-national-league-table-and-takes-first-place-in-greater-manchester/>

# University Of Bolton Scores For 'Student Satisfaction' In Complete University Guide 2019



<https://www.bolton.ac.uk/university-of-bolton-scores-for-student-satisfaction-in-complete-university-guide-2019/>

# University Of Bolton Ranked 6th Overall In UK Engagement Survey 2018



<https://www.bolton.ac.uk/university-of-bolton-ranked-6th-overall-in-uk-engagement-survey-2018/>

# Stop Press

- *The University of Bolton is featured in The Times and The Sunday Times Good University Guide 2019 highlighting that students rate their teaching among the best in the UK.*
- *The guide says that in the most recent National Student Survey, students ranked Bolton fourth in the UK for satisfaction with teaching quality under a Sunday Times analysis of the outcomes.*

# *Engineering Heritage at Bolton*

- *Established 1825 as Mechanics' Institute*
- *Bolton Institute of Technology - 1963*
- *Bolton Institute of Higher Education - 1982*
- *Incorporated in 1989*
- *Degree awarding powers 1992*
- *Research Degree awarding powers 1995*
- *University title in 2005*

# Our New Engineering Building

£13m Development 2017



# National Centre for Motorsport Engineering





# *Recent Investment in Facilities*

- *Recent circa £1 Million invested in facilities for engineering*
- *Centre for Advanced Performance Engineering*
- *Electrical and Electronic Engineering laboratories*
- *Projects workshop*
- *CNC machinery*
- *New facilities planned for Civil Engineering and Construction this year*

# *School of Engineering Programme Areas*

- *Automotive / Motorsport (Summer School 2019)*
- *Bio Medical Engineering*
- *Civil Engineering*
- *Construction Project Management*
- *Electrical & Electronic Engineering (Summer School 2019)*
- *Mathematics*
- *Mechanical Engineering (Summer School 2019)*
- *Mechatronics (Summer School 2019)*
- *Systems Engineering*

*Programmes from Foundation Programme through to PhD*

# School of Engineering Programmes

- **BEng** - Mechanical, Electrical & Electronic, Civil Engineering, Bio-Medical Engineering, Automotive - All accredited by professional bodies (Full-Time & Part-Time)
- **BSc** - Construction Project Management & Motorsport Technology
- **MSc** - Systems Engineering and Engineering Management - Mechanical, Electrical & Mechatronics.
- **MRes** - Engineering Management & Environmental Management
- All undergraduate programmes in top-up mode with summer school attendance.
- <https://www.bolton.ac.uk/subject-areas/all-subjects/>

# Multidisciplinary International Staff Team

- Our staff come from over 10 different countries bringing an international dimension to all our programmes
- We have collaborative partners delivering our programmes throughout the world



# Professional Body Accreditation

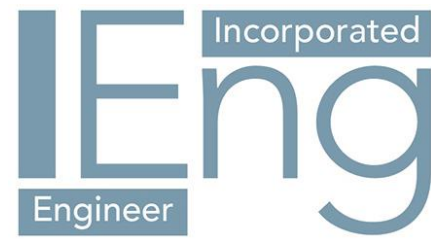
The *Institution*  
of *Structural*  
*Engineers*



ice



# Professional Registration



# Our Ethos

- *We deliver a wide range of taught undergraduate & Postgraduate programmes.*
- *Strong research background, delivering a number of PhD's both and on campus, and off-campus with collaborative partners.*
- *Strong ethos of working with industry*
- *All undergraduate programmes developed as UK Apprentice Degrees for delivery to industrial based students.*
- *Track record of delivering KTP's (UK Government sponsored - Knowledge Transfer Partnerships)*
- *Up to date modern facilities with dedicated Engineering building.*
- *Majority of staff practice based with significant industrial and research experience.*
- *Over 90% staff qualified at Doctorate Level or Chartered Engineers.*

# *Strong Links with Industry*

- *Industrial Advisory Board helps develop our programmes*
- *Research Projects*
- *Help with placements*
- *Good employment record for all our students*
- *Apprenticeship programmes*
- *Links with employer groups*



# *Our Approach to Teaching*

- *Small Class sizes -Less than 30 students in most cases*
- *Lots of individual support*
- *Industrially relevant curriculum*
- *Dedicated team of mathematicians*
- *Enhanced Personal Tutor System*
- *Specialist study support modules on a range of topics*
- *Formative assessment policy with lots of feedback*
- *A focus on innovation and problem solving in all programmes*
- *Teaching Intensive Research Informed (TIRI)*

# Teaching Intensive Research Informed

- *Our principal focus is on teaching and supporting students*
- *We like all our staff to engage in research*
- *We have a strong research profile with over 70% of our research deemed to be of international standing and excellent in the last Research Excellence Framework*
- *The research activity helps our staff to be up to date in their teaching*
- *We challenge students with industrially relevant problems*

# *MRes - Master of Research*

- A UK based Level 7 qualification focussing on research training.*
- A Foundation for a research career in industry and study at PhD level.*
- Can give advanced standing for entry into a Doctorate programme.*
- Study modes - Full-Time and Part-Time.*
- Industry based.*

# Origins of the MRes – Master of Research

Borne out of our successful off-campus PhD Programme

- Currently being delivered in:
  - Malawi
  - Zambia
  - Greece
  - Germany
  - Ras Al-Khaimah
- Based on practitioner model where students work full-time in industry or in industrial led research centres, combining practice with research.
- Supported by University led workshops within the off-campus centres.
- Each year culminates in a Research Conference where all students present with industry and external stakeholder presence.

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# *MRes Philosophy*

- *Research Methods core to the programme.*
- *Practice based - combining industrial practice with academic study and research.*
- *A problem solving philosophy.*
- *Work towards publishable research outcomes.*
- *Culminates in a Conference where all students present a paper based on their research and industrial practice.*

# MRes - Master by Research

Master by Research (MRes)	Final Award	Level 7	Environmental Management
Postgraduate Diploma (PgDip)	Exit or Fallback Award	Level 7	Environmental Management
Postgraduate Certificate (PgCert)	Exit or Fallback Award	Level 7	Environmental Management

# *MRes Programme Specification*

- <http://programmes.bolton.ac.uk/ENG006-F-UOB-MX-01>
- <http://programmes.bolton.ac.uk/CIE007-F-UOB-MX-01>



# Validated Modules - Engineering Management

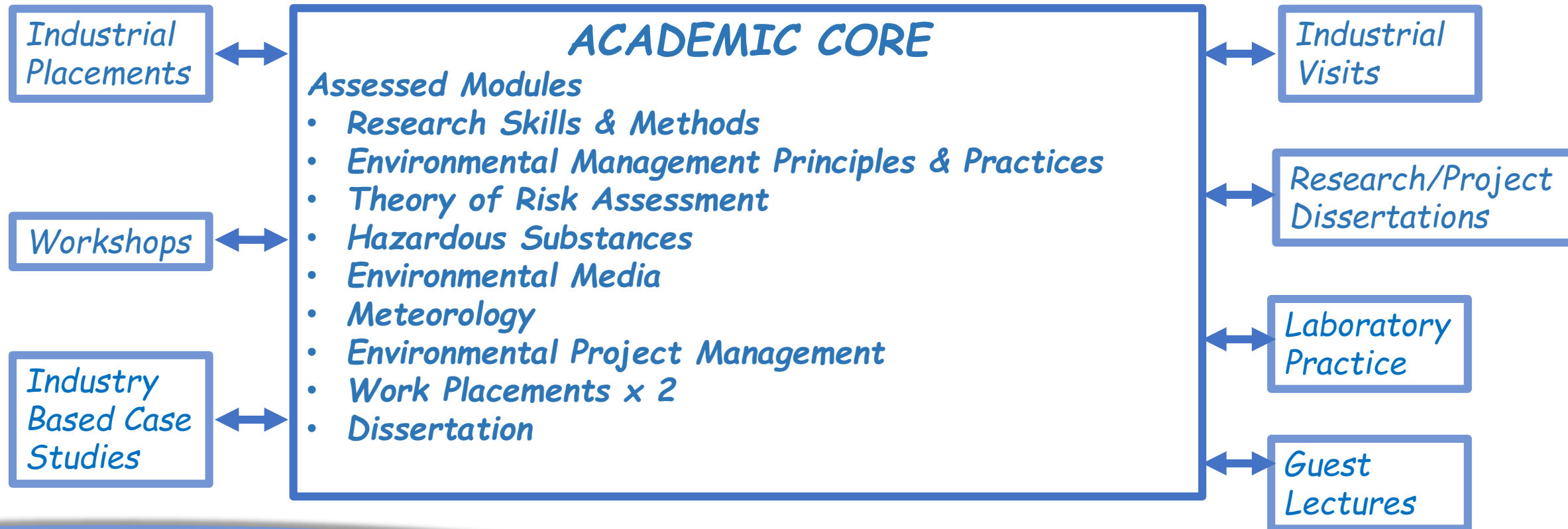
<i>Title</i>	<i>Module Code</i>	<i>Credits</i>
<i>Research Skills and Methods</i>	<a href="#"><u>ENG7000</u></a>	<i>Core - 20</i>
<i>Integrated Management Systems</i>	<a href="#"><u>ENG7001</u></a>	<i>Optional -20</i>
<i>Project Management</i>	<a href="#"><u>ENG7002</u></a>	<i>Optional-20</i>
<i>Business and Management in Engineering</i>	<a href="#"><u>ENG7003</u></a>	<i>Core-20</i>
<i>Work-based Project 1</i>	<a href="#"><u>ENG7004</u></a>	<i>Core-20</i>
<i>Work-based Project 2</i>	<a href="#"><u>ENG7005</u></a>	<i>Core-40</i>
<i>Dissertation</i>	<a href="#"><u>ENG7006</u></a>	<i>Core-60</i>
	<i>TOTAL Credits</i>	<i>180 (incl. 1 option)</i>

# Validated Modules - Environmental Management

<i>Title</i>	<i>Module Code</i>	<i>Credits</i>
Research Skills and Methods	<a href="#">ENV7000</a>	Core - 20
Environmental Management Principles and Practices	<a href="#">ENV7001</a>	Core - 20
Theory of Risk Assessment	<a href="#">ENV7002</a>	Optional -20
Hazardous Substances	<a href="#">ENV7003</a>	Optional-20
Environmental Media	<a href="#">ENV7004</a>	Optional-20
Meteorology	<a href="#">ENV7005</a>	Optional-20
Environmental Project Management	<a href="#">ENV7009</a>	Optional-20
Work-based Project 1	<a href="#">ENV7006</a>	Core-20
Work-based Project 2	<a href="#">ENV7007</a>	Core-40
Dissertation	<a href="#">ENV7008</a>	Core-60
	<i>TOTAL Credits</i>	<i>180 (incl. 1 option)</i>

# MRes Structure & Delivery

60 Credits - Taught  
120 Credits - Work  
based/Research



# Current School Research Partners

*DSTL/EMA(France) UK-France Partnership 2016- to date*

*Hylomar-KTP (MPhil Student) 2017-19*

*Walker seals Cumbria (PhD/MSc students) 2015 to date*

*Shanghai University (PhD exchange) 2005 to date*

*US Police force (PhD Student) 2014 to date*

*ITECH France 2002 to date*

*South Westphalia University of Applied Sciences for Engineering Systems/Renewables Systems-MSc/PhD dual awards 1998-to date ( 25 PhDs and > 500 MScs)*

*Oxford Brookes(MORTEC), Albatec, Williams F1 2017*

*KCMC Darsbury, Manchester, Bristol & Liverpool Universities 2014-onwards*

*Philips Medical Instruments 2017*

*Keating Supercars*

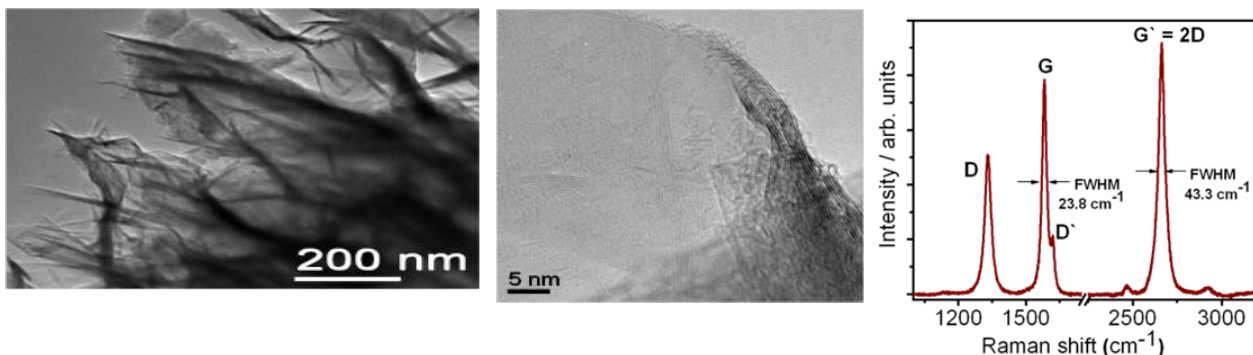
# EE Research Activities

1. *Nanomaterials: ZnO, TiO<sub>2</sub>, CNTs, graphene etc*
2. *Processing (ALD, PVD) and devices*
3. *Sensors, microfluidics & lab-on-chip systems*
4. *Flexible, dissolvable, transitional electronics*
5. *Energy harvesting devices & wireless power transfer*
6. *Wireless, self-powered and passive sensors*
7. *Wireless sensing for healthcare and medicine*
8. *Expert systems*

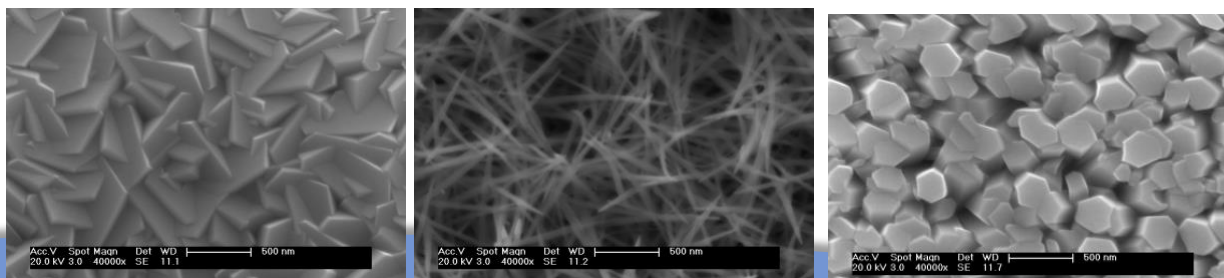
# Nanomaterial synthesis & applications

Able to synthesize/process nanomaterials: ZnO, TiO<sub>2</sub>, MnO, graphene, graphene oxide, CNTs

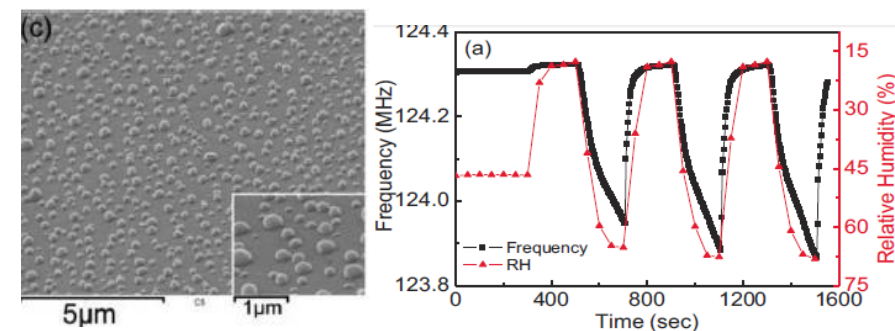
## Vertically Aligned Graphene (FLG) Synthesis



## ZnO nanorods and devices

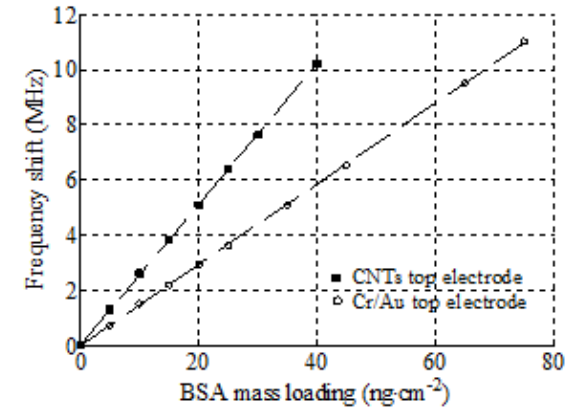
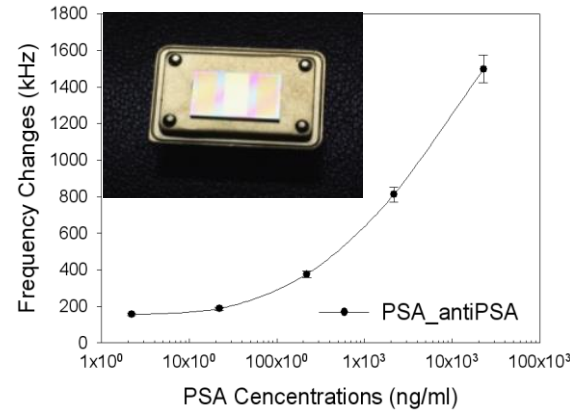
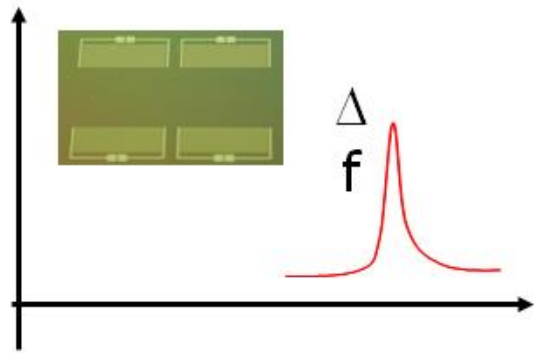


## Silver nanoparticles/H-sensors

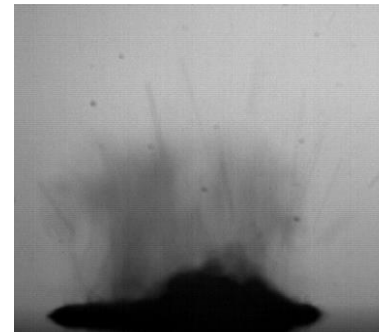
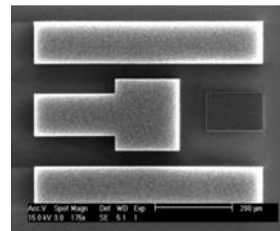
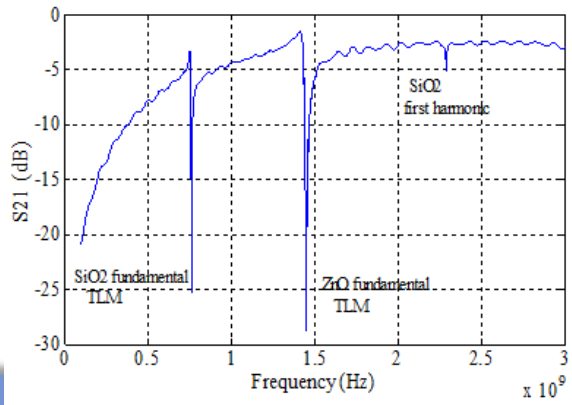


# Physical and Biochemical sensors

## SAW Biosensor for PSA sensing

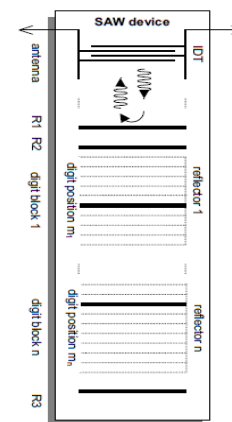
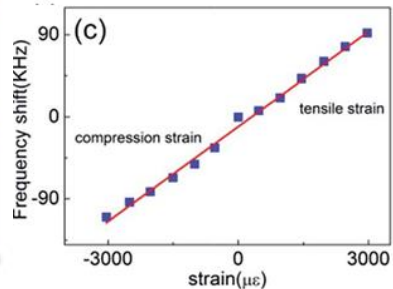
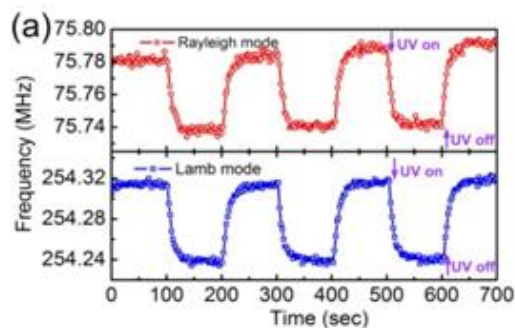
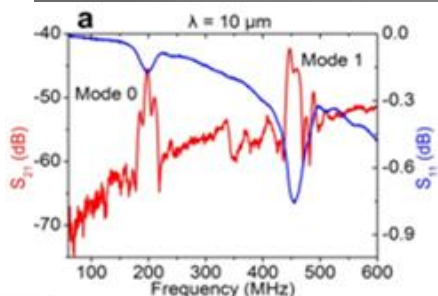
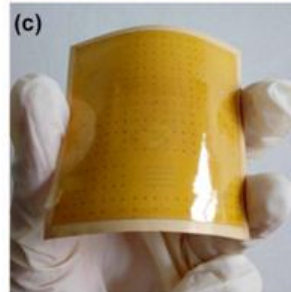
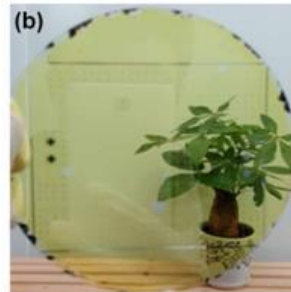
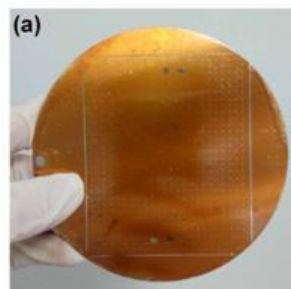
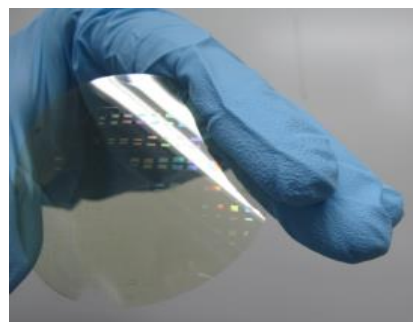
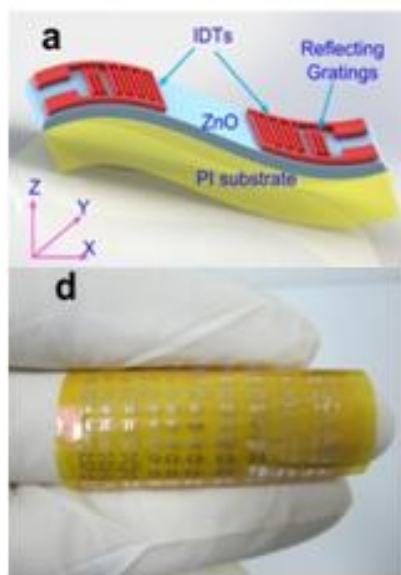


## SAW atomizer, pump, particle concentration

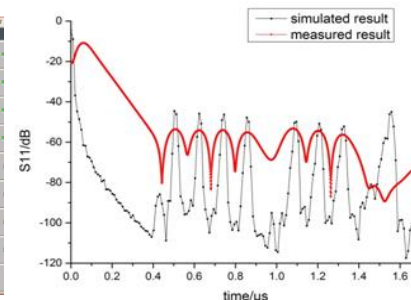
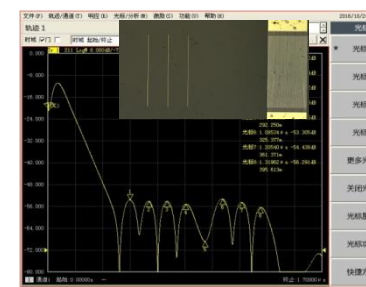


# Flexible/Transparent Sensors

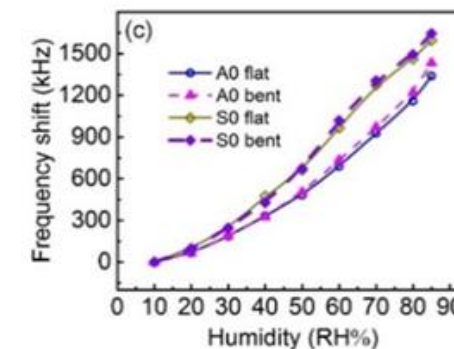
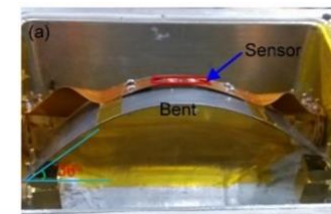
High sensitivity temp., UV, strain sensors  
–wearable applications



## Passive wireless high-T SAW sensors



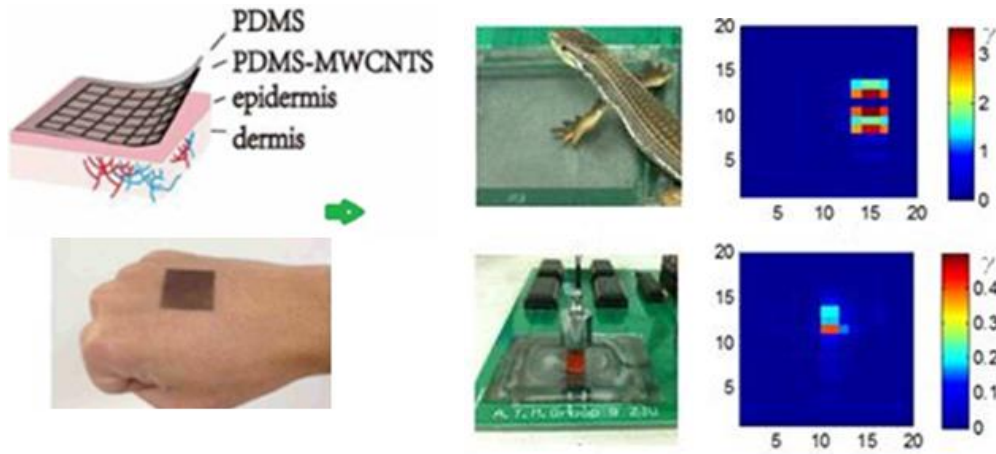
## Humidity sensing



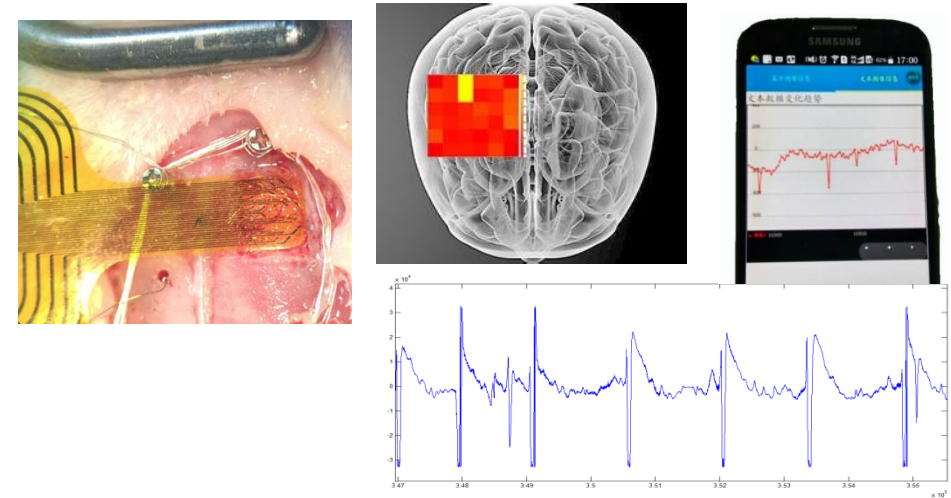


# Flexible/Dissolvable Electronics for Biomedicine

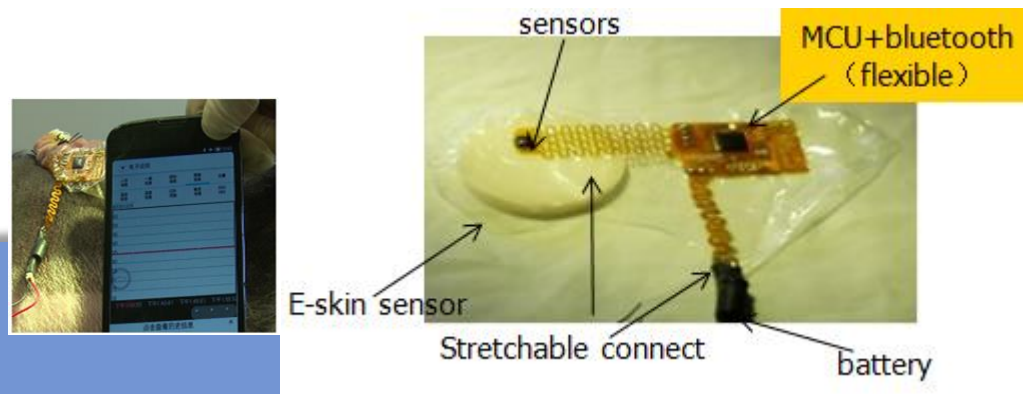
## Electronic-skin sensors



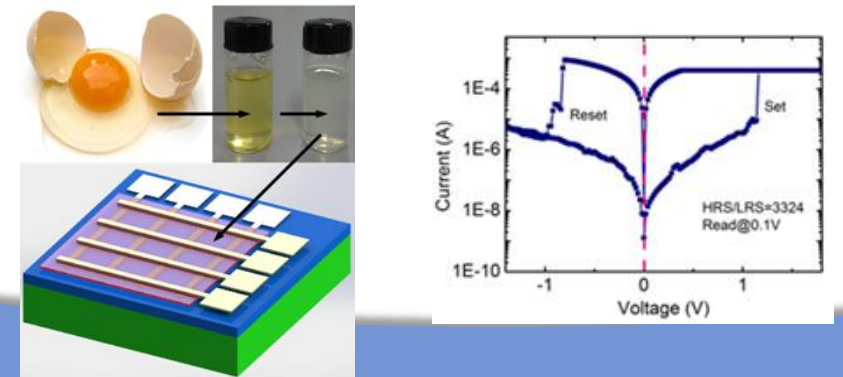
## Portable brain-phone epilepsy detector



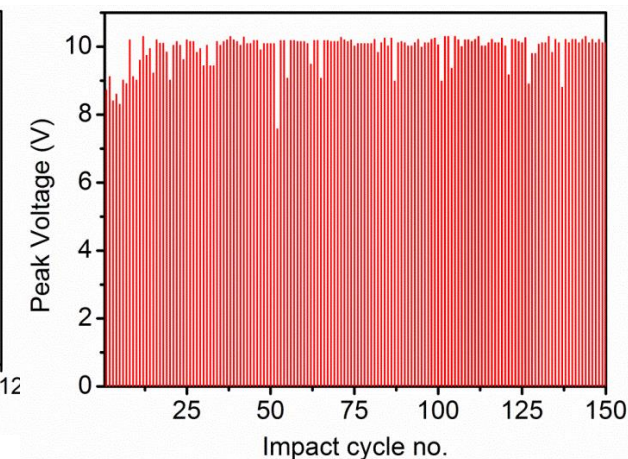
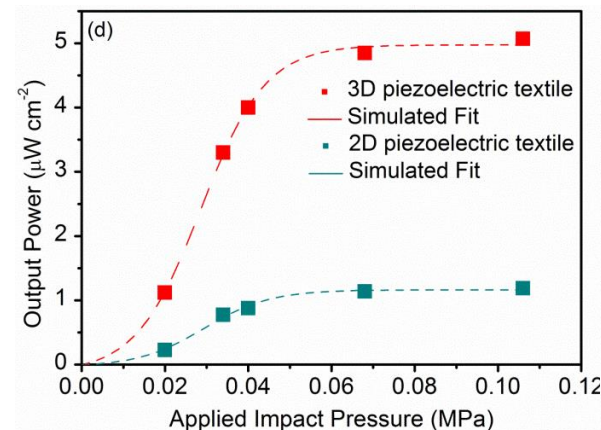
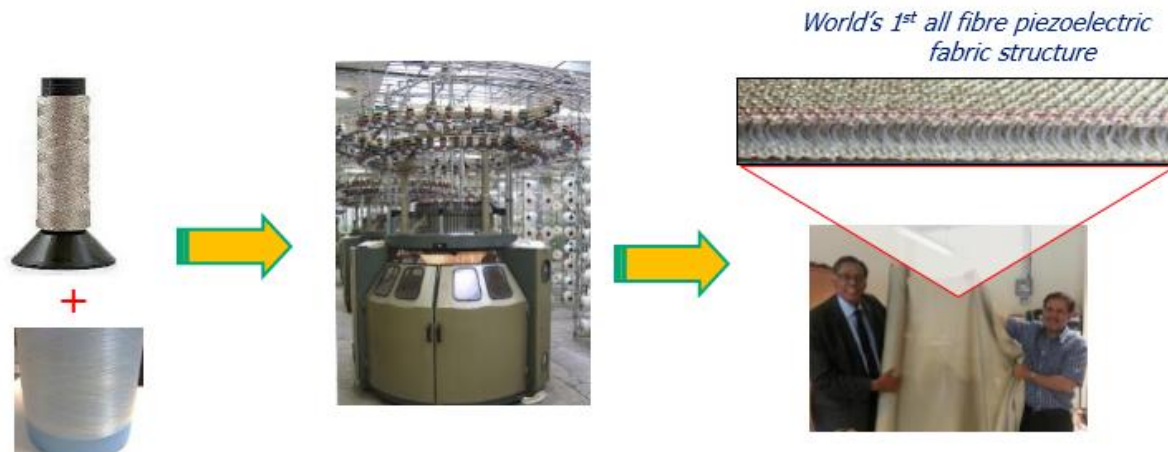
## Mobile phone based wound monitoring



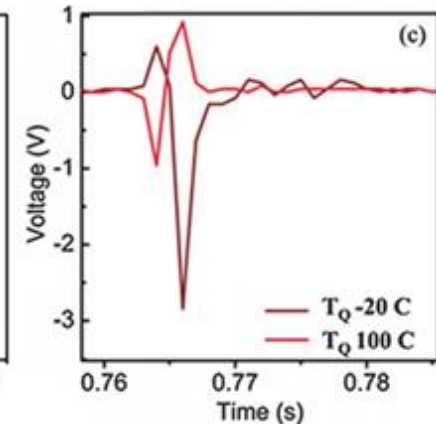
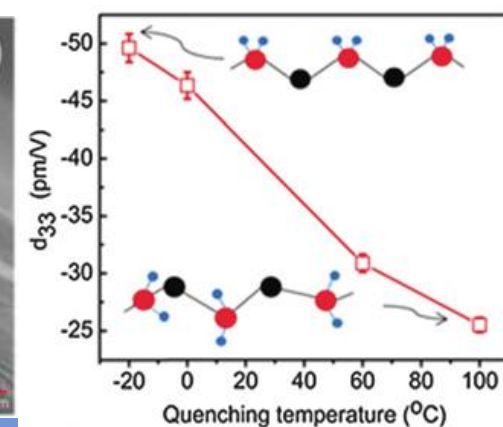
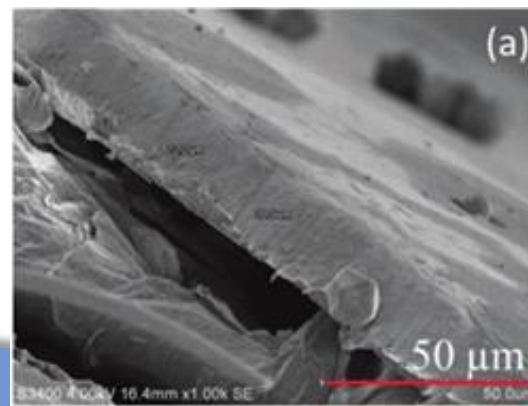
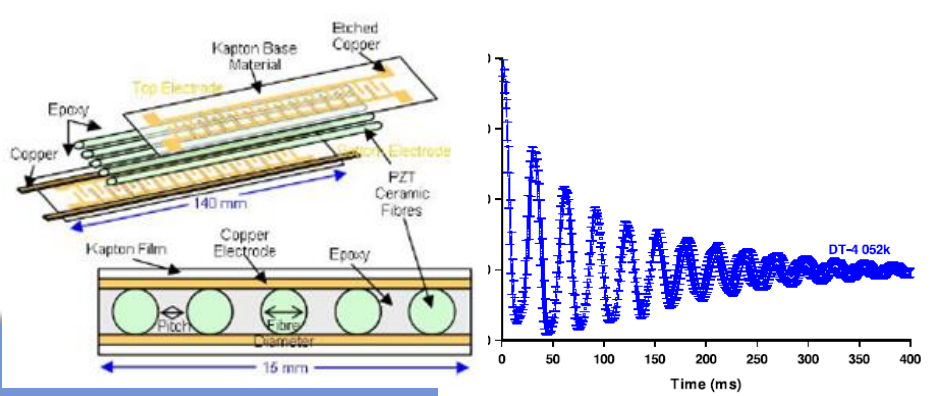
## Dissolvable electronics



# Piezoelectric polymer based generators

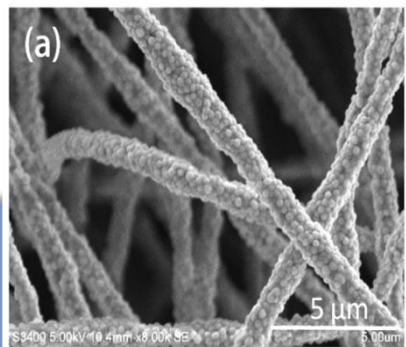
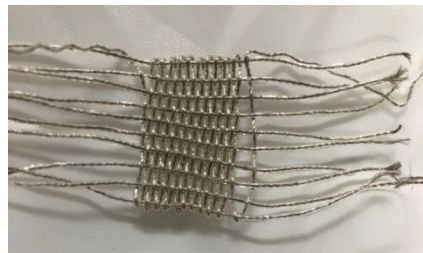
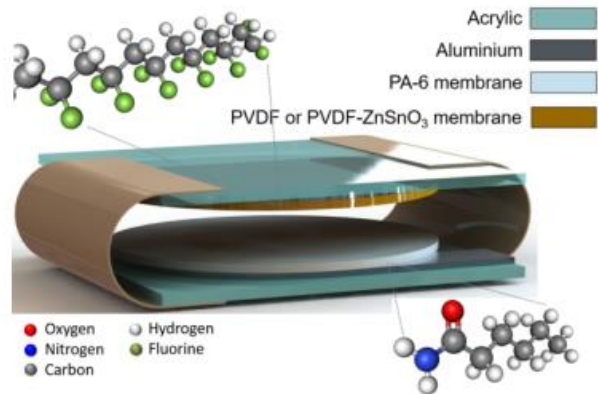


Exclusive self-aligned  $\beta$ -phase PVDF films have  $d_{33} \sim 50\text{pm/V}$

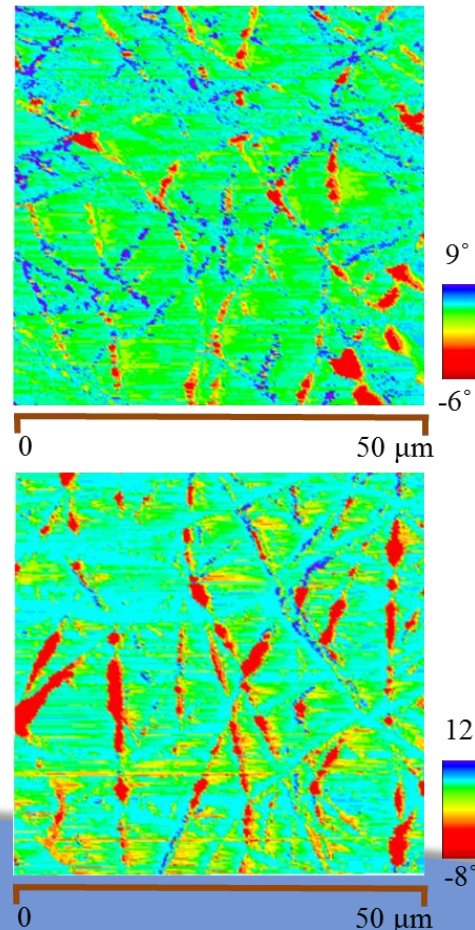


# Micro-energy sources

## Triboelectric generators

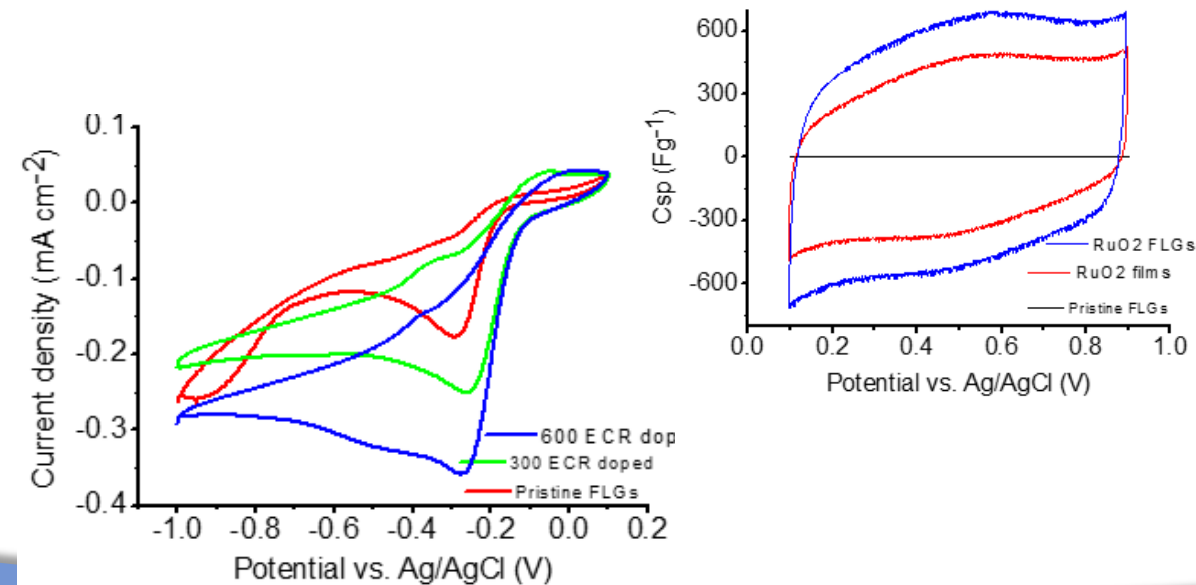


EFM Phase



Material synthesis;  
Structures optimization/modelling;  
Electronics for storage/application;  
Self-powered sensors.

## Fuel Cells, Supercapacitors

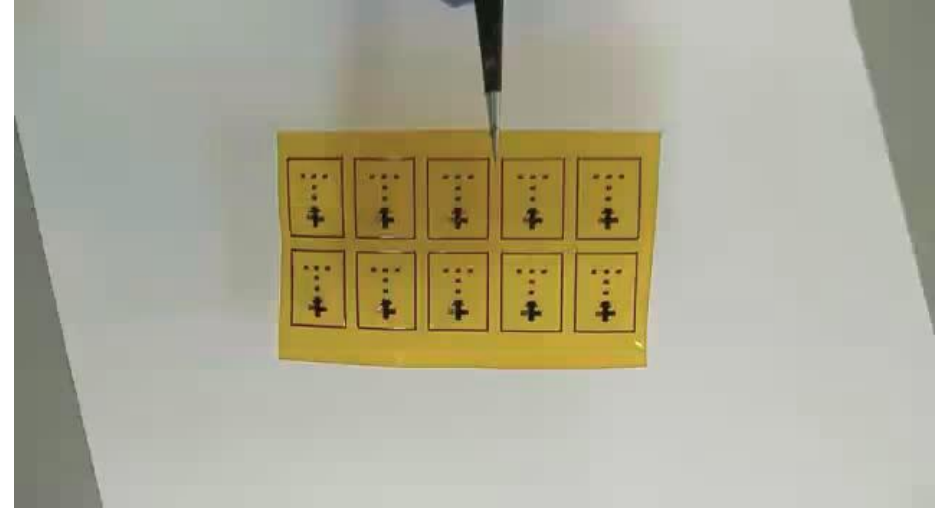


# Antenna design & wireless sensor networks

## Drainage infrastructure monitoring



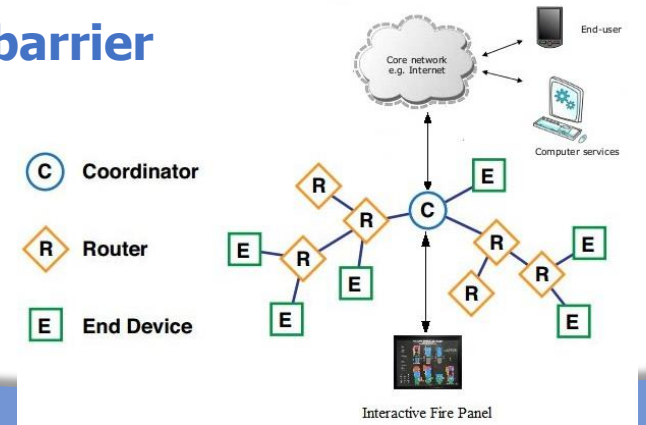
## Laser printed 5G antennas



## Traffic control

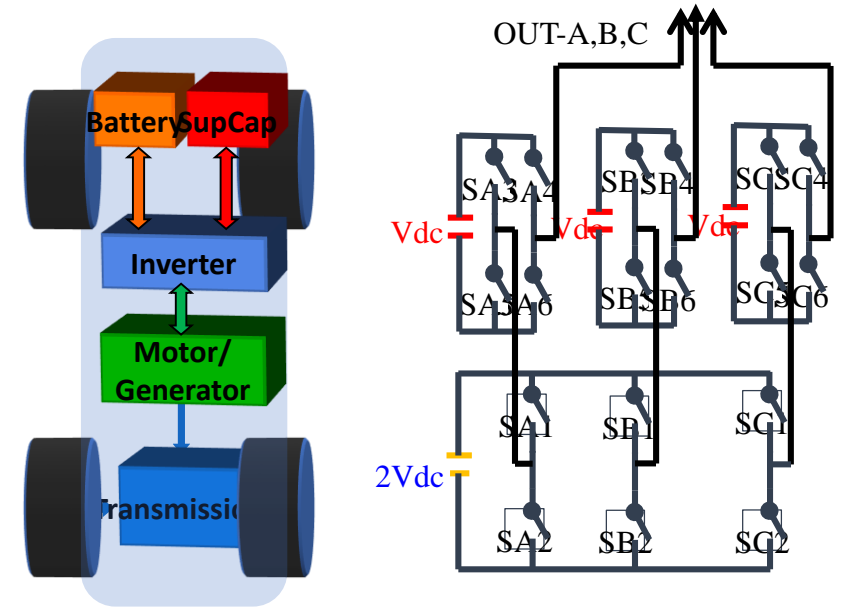
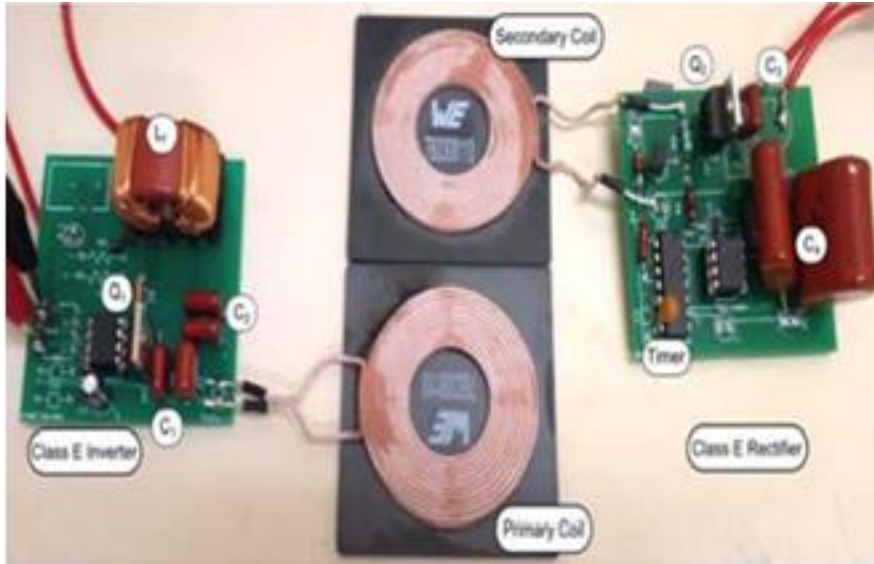


## WSN for fire protection barrier



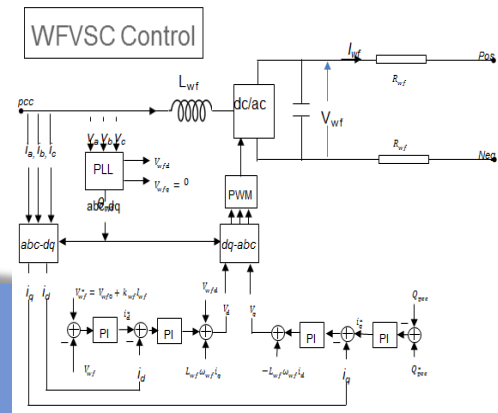
# Wireless power transfer/power electronics

## Wireless power transfer: 1-100W



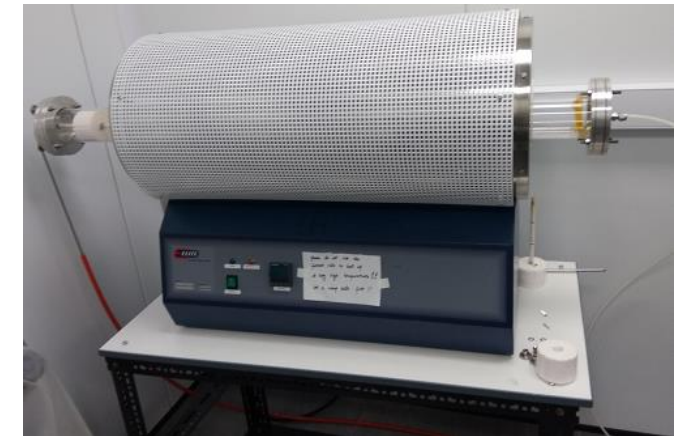
For vehicle power regulation

## For wind turbines power generators



# Facilities & Equipment

- *Class 1000 cleanroom*
- *Thin film process equipment:*
  - ALD
  - Rf, DC Plasma Sputtering
  - E-beam evaporator
  - Thermal furnace
  - Wet bench
- *Electrical test lab:*
  - IV, CV, Hall meas.,
  - Probe station,
  - UV Vis.,
  - Solar cell meas.
  - SEMs, AFM



# Research Collaborators

## *National collaborators:*

*Universities of Cambridge, Warwick, Birmingham, Newcastle, West Scotland, Bradford, Sheffield, Chester, Imperial College*

## *International collaborators:*

*Virginia Commonwealth University, USA*

*Zhejiang University (China)*

*Shanghai 2<sup>nd</sup> Polytech University (China)*

*University of Alberta (Canada)*

*University of South Africa*

*IIT Mumbai (India)*

# *The Offering for 2018/2019*

- *£9250 full fee but you get a bursary.*
- *£7700 per student, with students paying for their own accommodation. The University will assist students to find private accommodation in Bolton.*
- *Summer School £1000/student includes accommodation.*
- *Monday 29<sup>th</sup> of July to Friday 23<sup>rd</sup> of August 2019.*
- *Typically private accommodation in Bolton is £50 to £90 per week per student.*



- Presentation one
- presentation two



Teaching Intensive, Research Informed

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