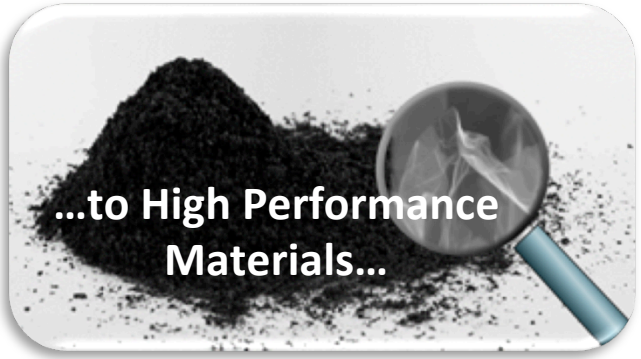
# Innovation in Functional and 2D Advanced Materials





***Professor Krzysztof K.K. Koziol***

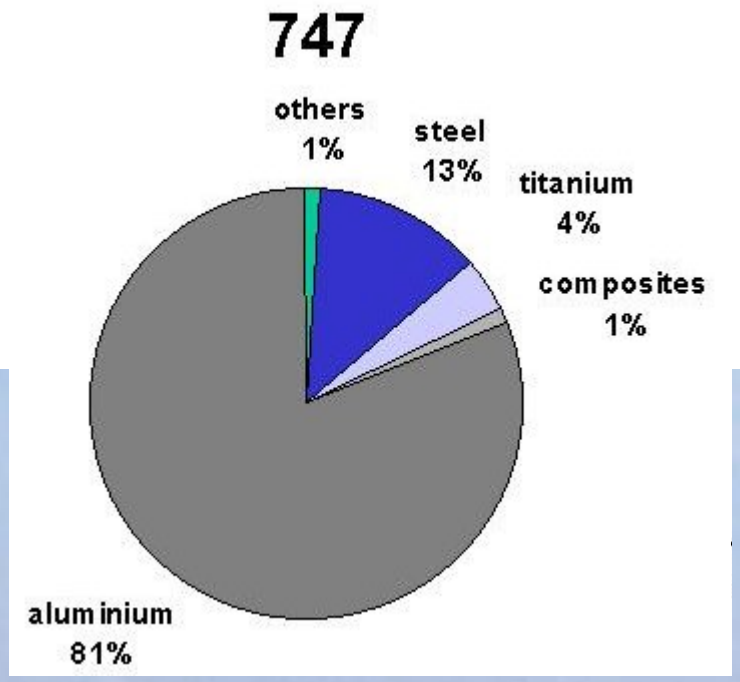
Department of Manufacturing
School of Aerospace, Transport and Manufacturing
Cranfield University

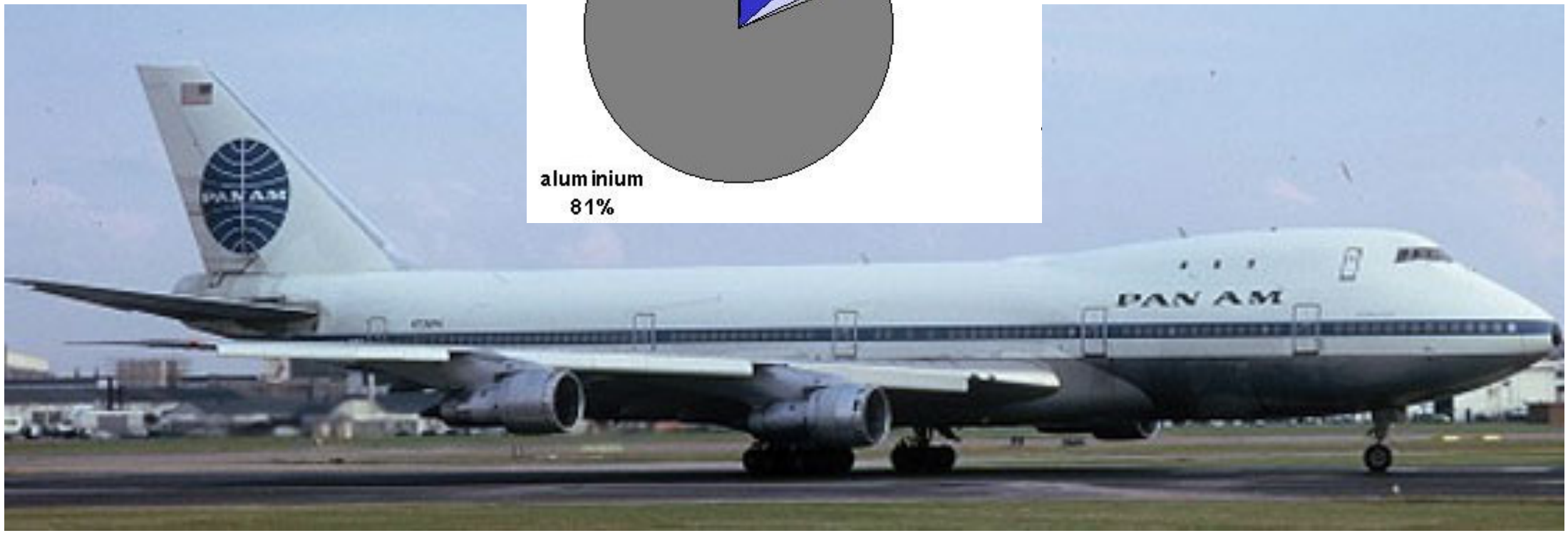
**k.koziol@cranfield.ac.uk**
**07739580339**


**5th HVM New Materials 2019**
**6-7 November Cambridge, UK**
**www.cir-strategy.com/events**

December 17th, 1903, **The Wright brothers**

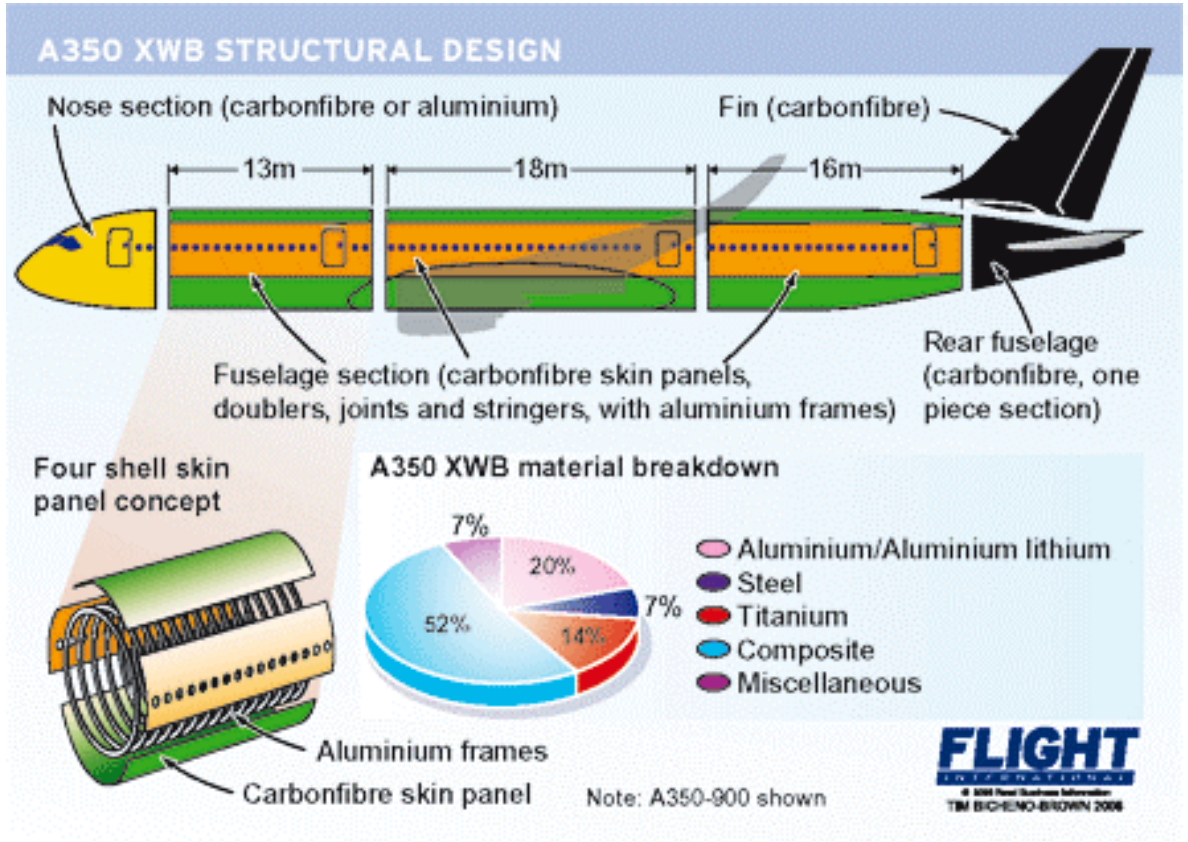
Construction material: giant spruce wood

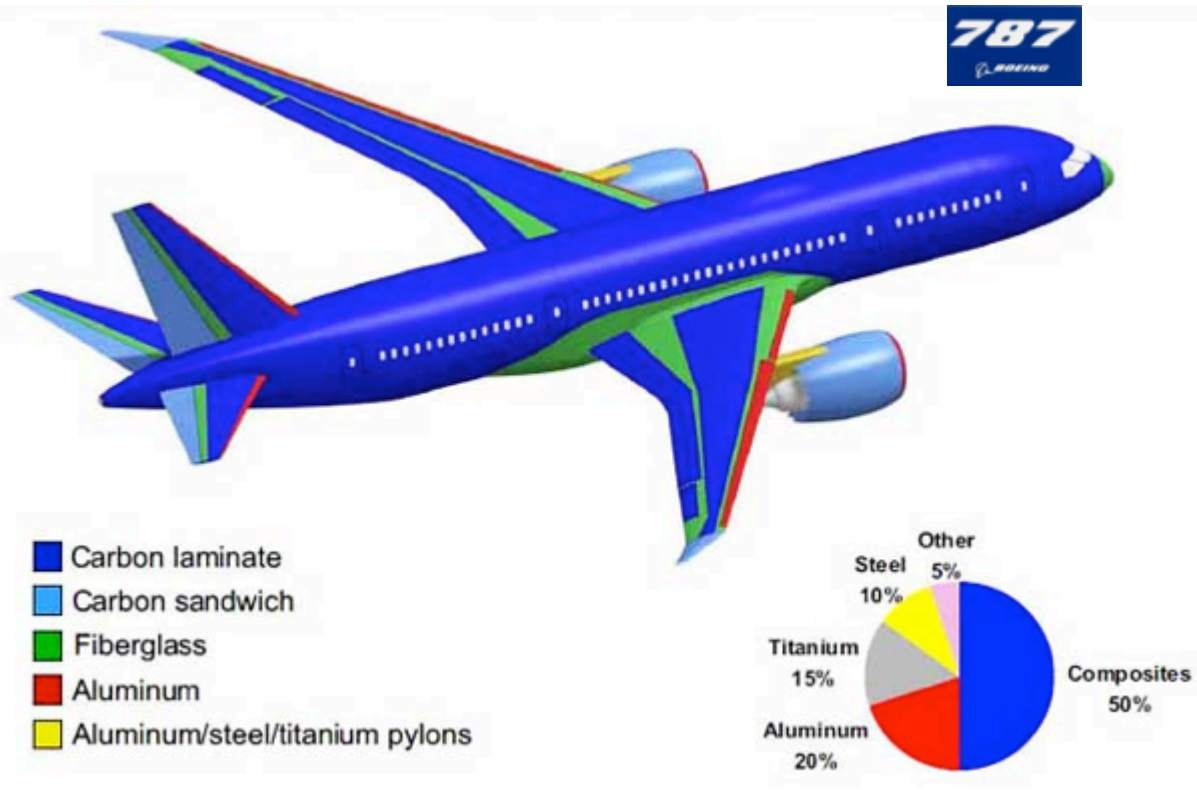



September 30th, 1968, the first 747

# Latest Commercial Aircraft Composition



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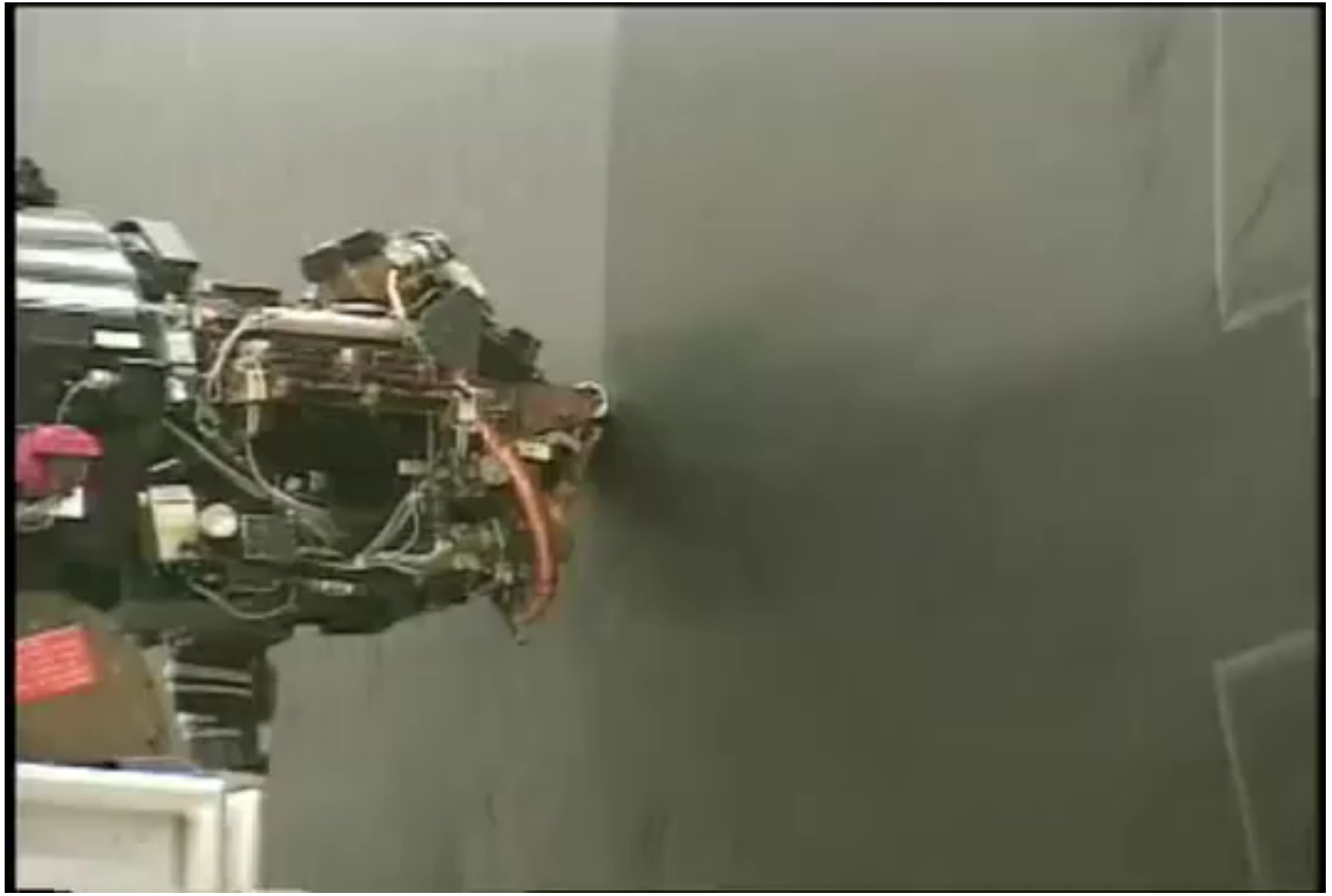
# Aircraft Fuselage Manufacturing



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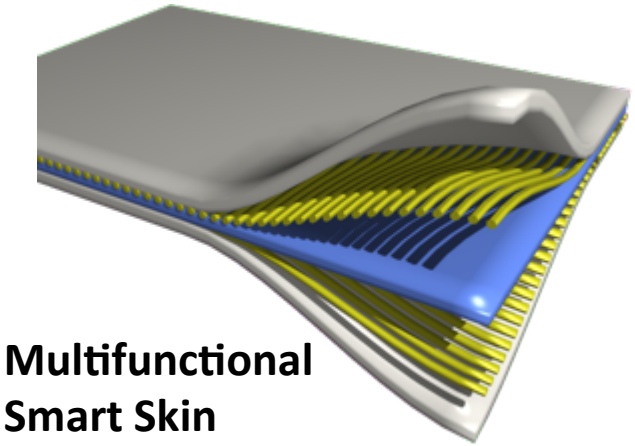
# The New Aircraft



Multifunctional Smart Skin

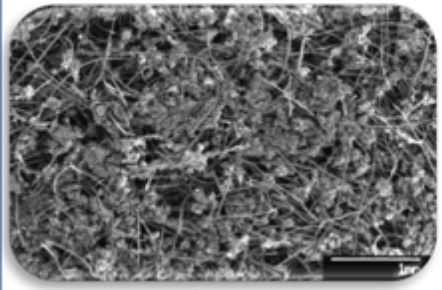
Supersonic


Avionics

New gen seats

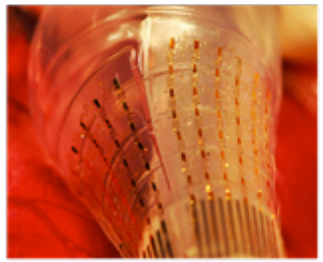
Propulsion

Fuel



*Nano-carbon composites*

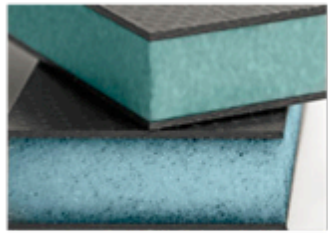
**Multifunctional composites**



**Out of autoclave, rapid manufacture**

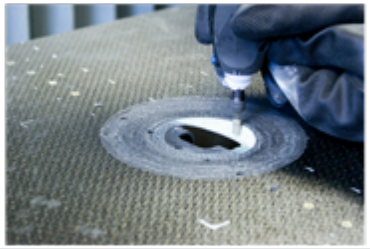
**Secure Composite Manufacturing**

**Affordable composite manufacture**



**Lightweight high performance composites**

**Rapid composites repair**



**Dissimilar materials and rapid fastening/joining**

**Fire retardant composites**

**NanoCarbon Lightweight E-motors**


Professor Krzysztof Koziol
Enhanced Composites and Structures Centre
School of Aerospace, Transport and Manufacturing
Building 61, Cranfield, MK43 0AL, UNITED KINGDOM
k.koziol@cranfield.ac.uk

**Composite Landing Gear**


**Sand erosion resistance**

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£
£
£

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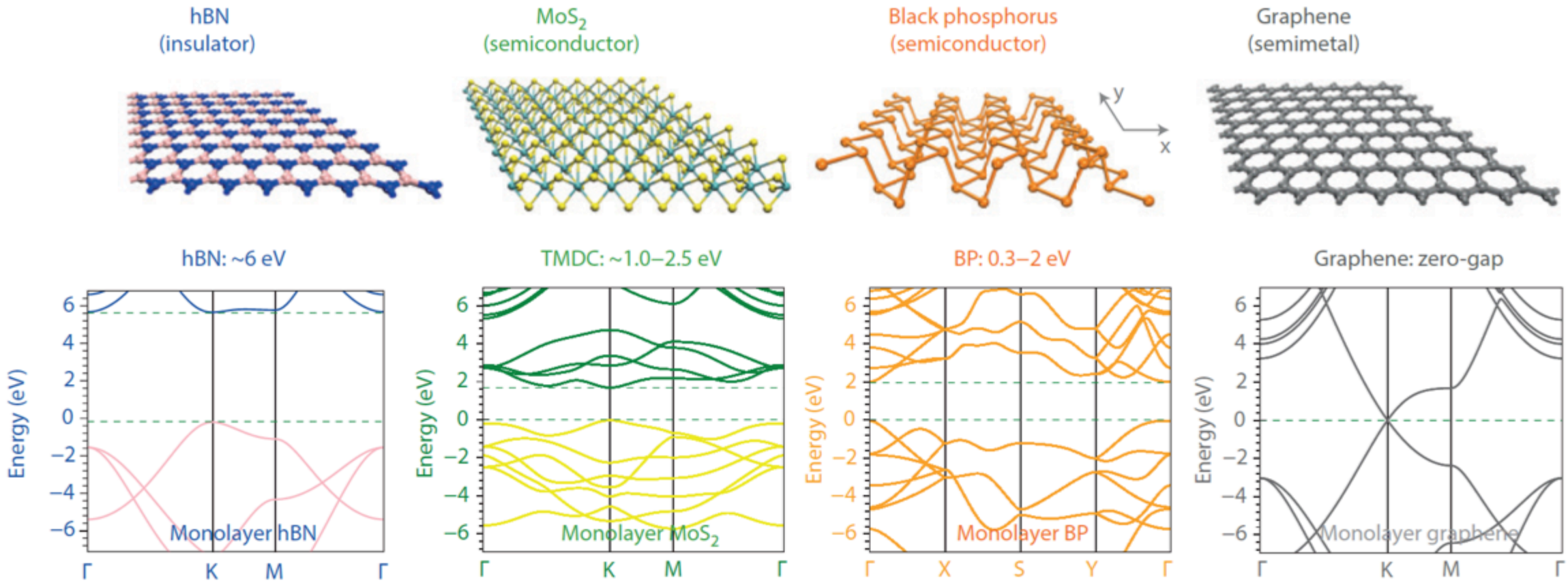
# 2D materials development




…designing electrical, magnetic, piezoelectric and optical functionalities.

**Two-dimensional material nanophotonics**
Fengnian Xia et al, Nature Photonics, 8, 899 (2014)

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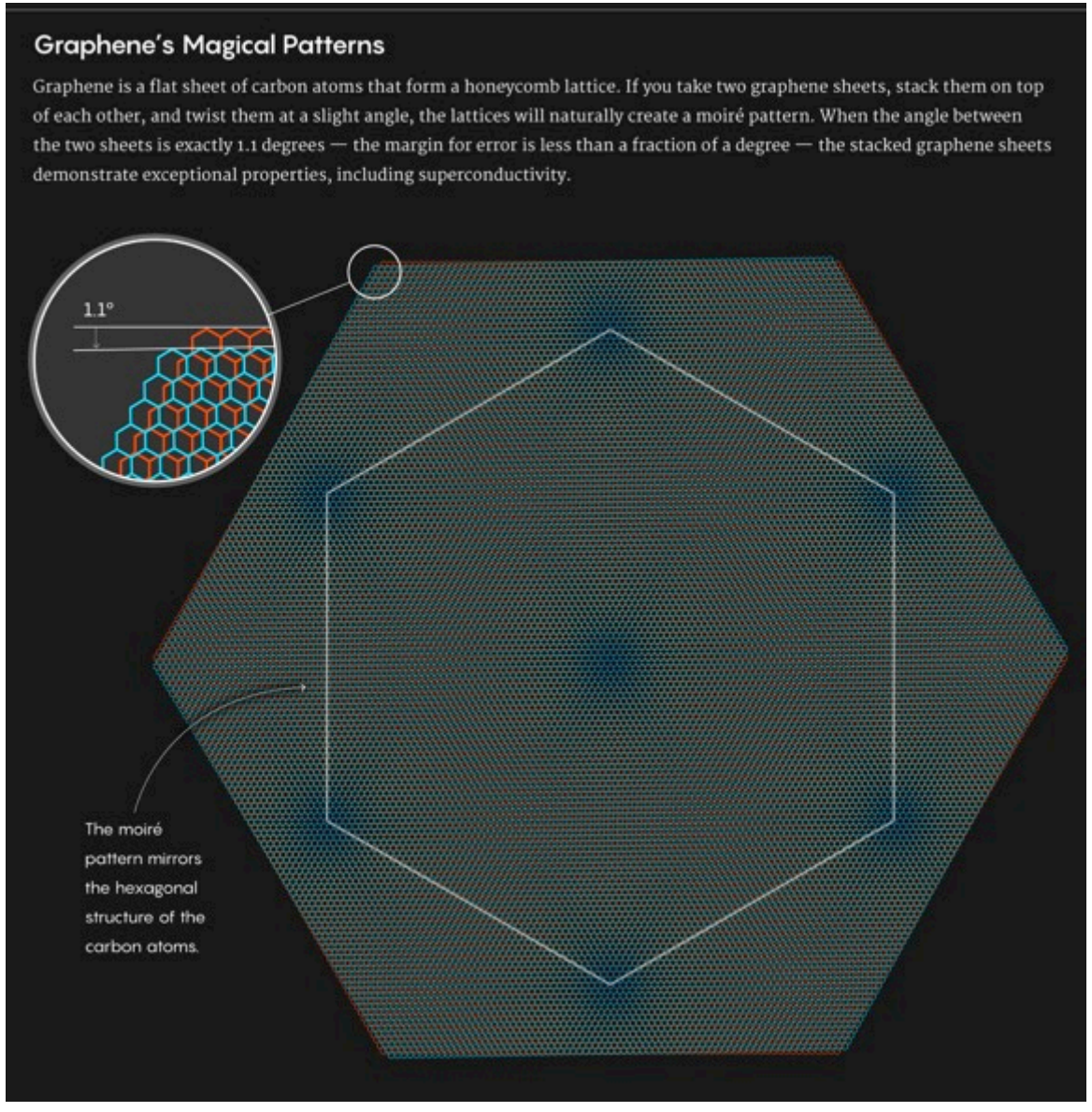
# 2D materials engineering




**How 'magic angle' graphene is stirring up physics**

Nature 565, 15-18 (2019)

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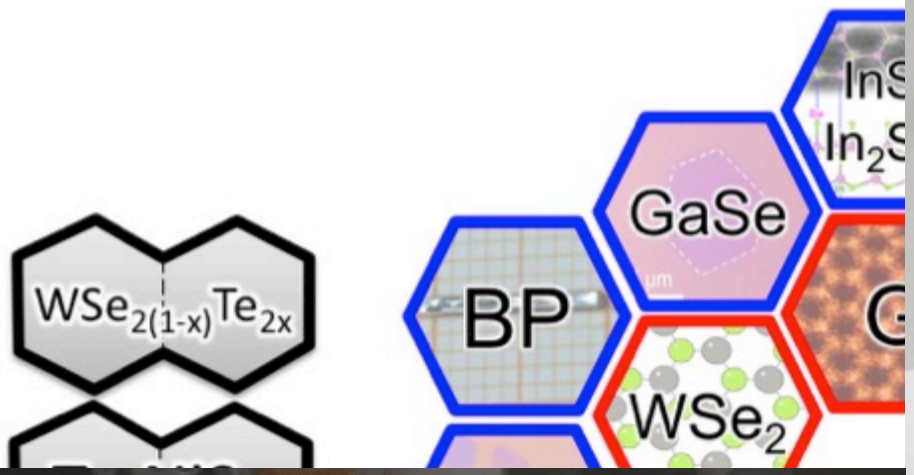
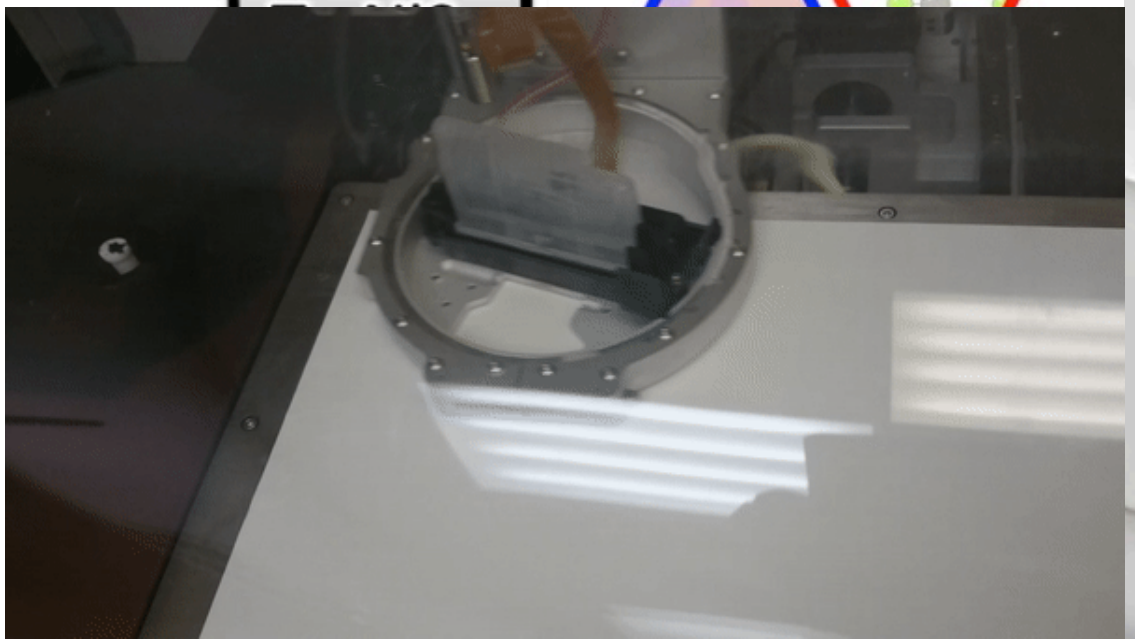
# 2D materials processin



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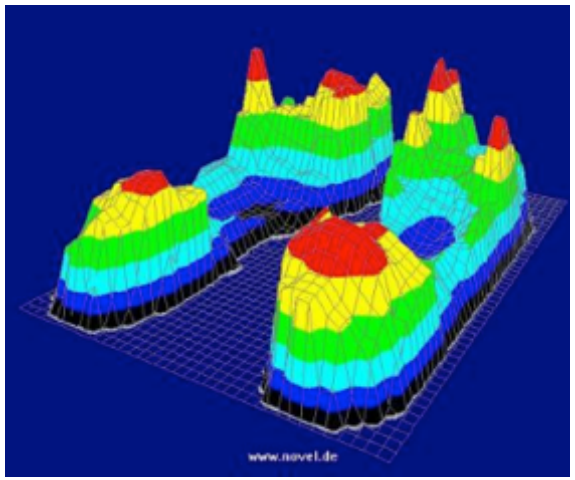
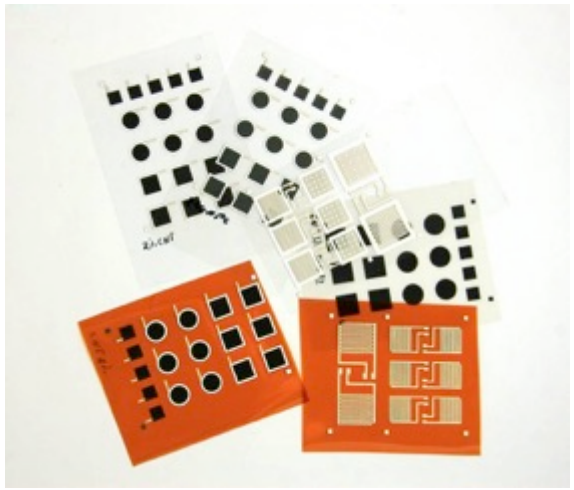
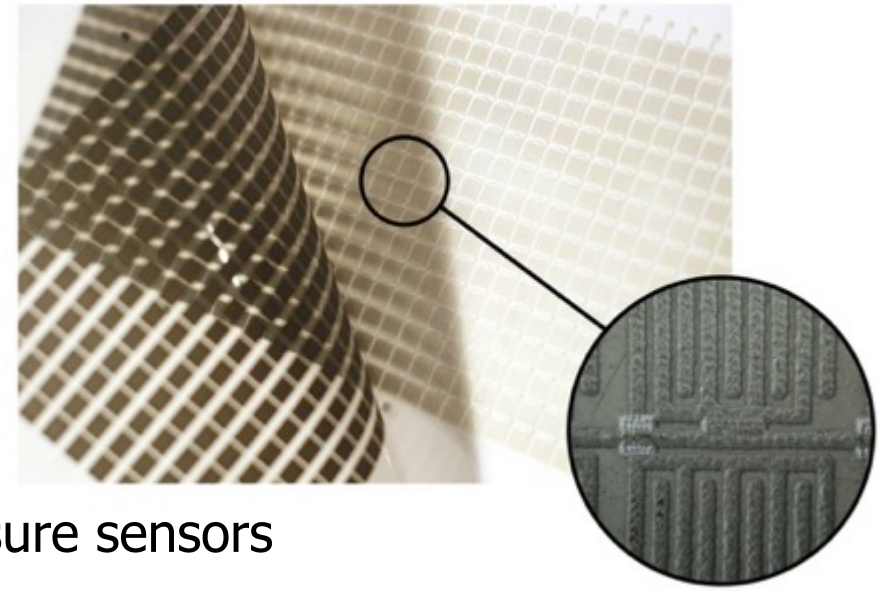
# Pressure and temperature sensors with 2D material integration for textronic applications



Textronic temperature sensors



Pressure sensors

**Małgorzata Jakubowska**
Warsaw University of Technology

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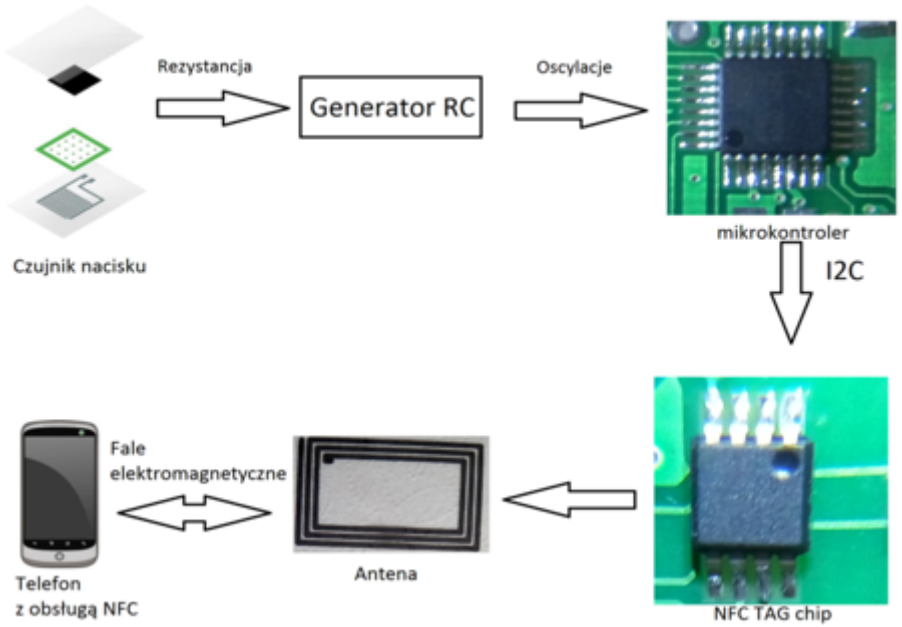
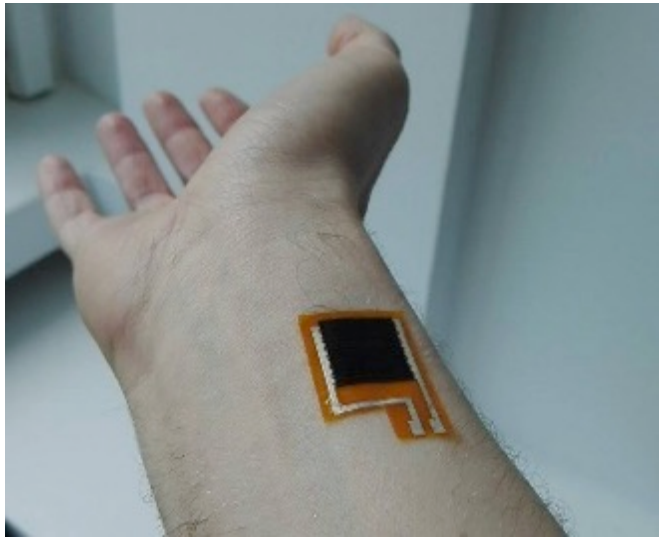
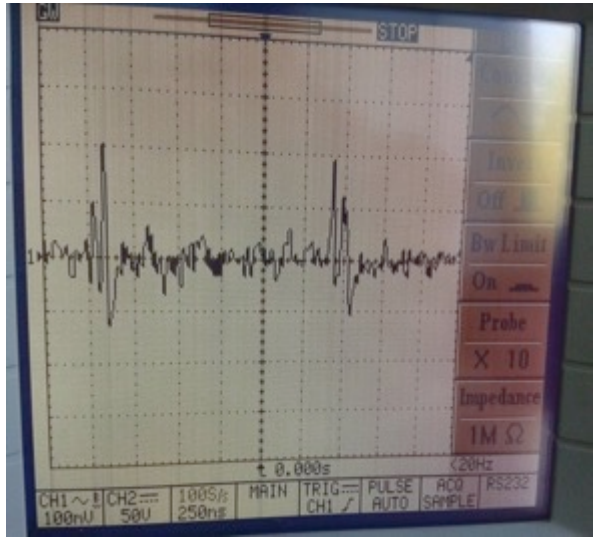
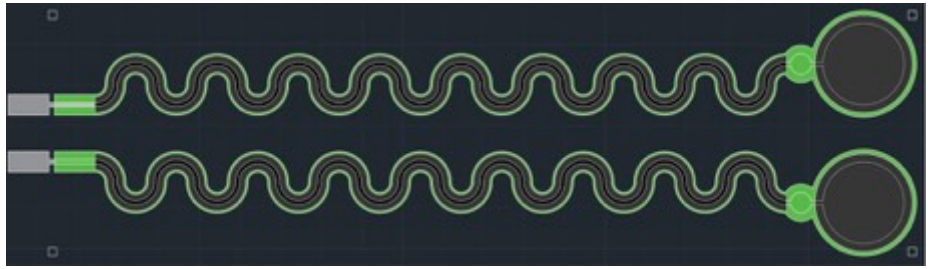
# 2D material assembly for pulse and EEG sensing





**Małgorzata Jakubowska**
Warsaw University of Technology

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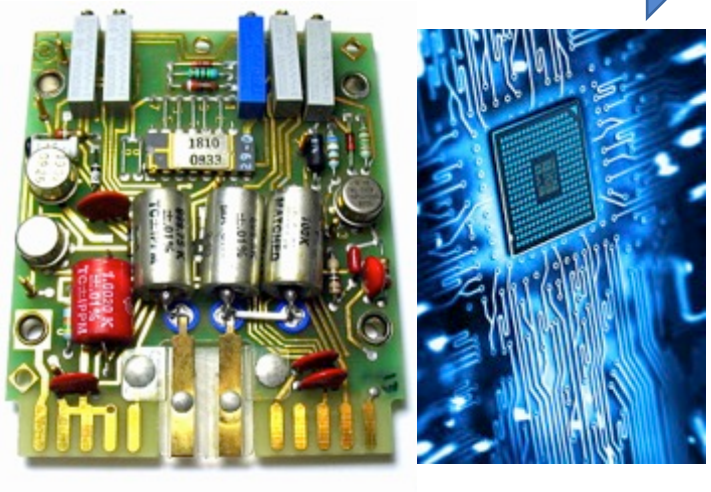
# Advances in display and microelectronics

Miniaturisation process



Functional components

Smart Skins

Load-bearing components

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# Construction: Coatings (fire, moisture and sound)

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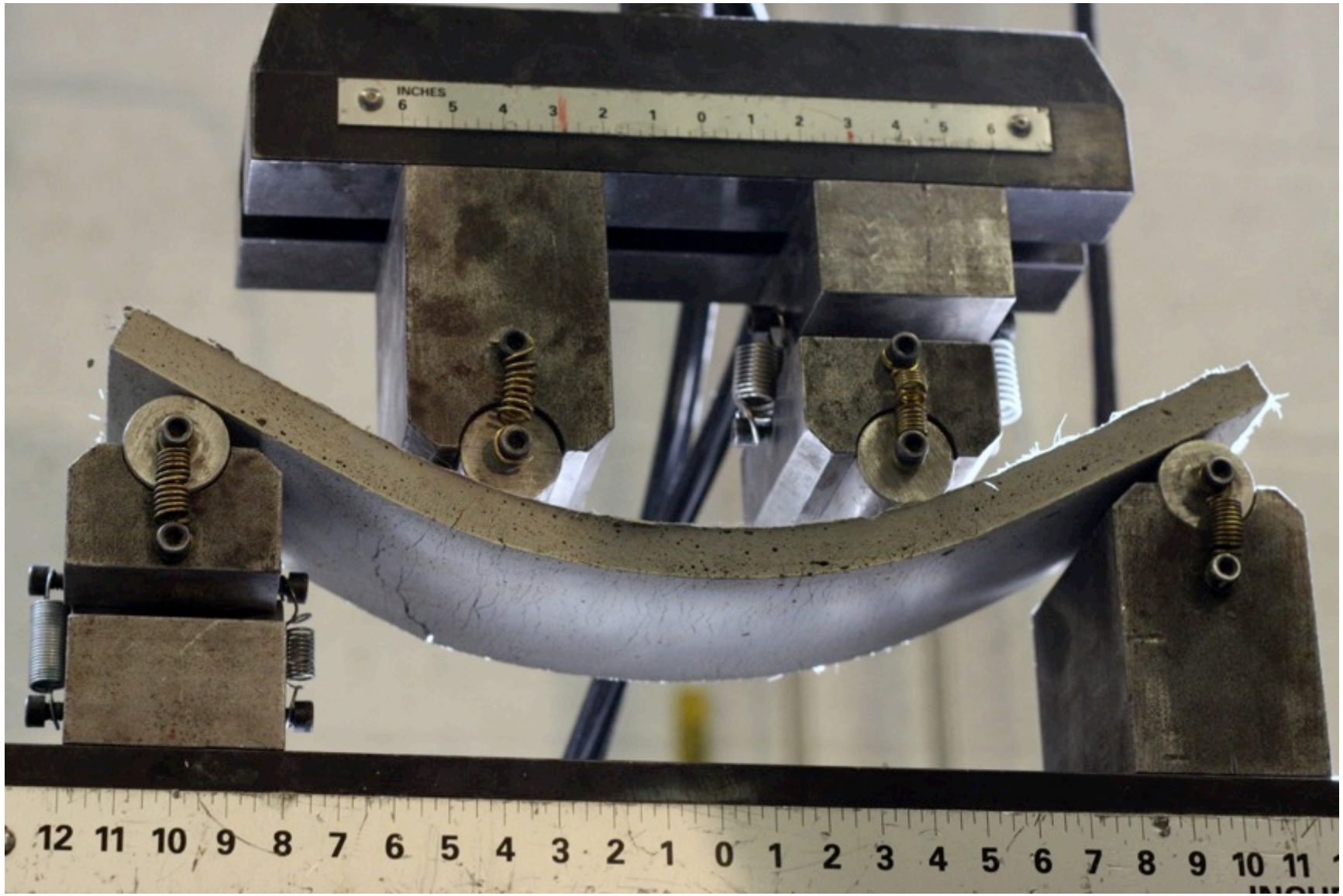
# Construction: new load bearing structures




Fibre-reinforced bendable concrete developed by University of Michigan scientists.

By adding polymer microfibres, Nanyang Technological University researchers created a concrete that can flex and bend under tension.

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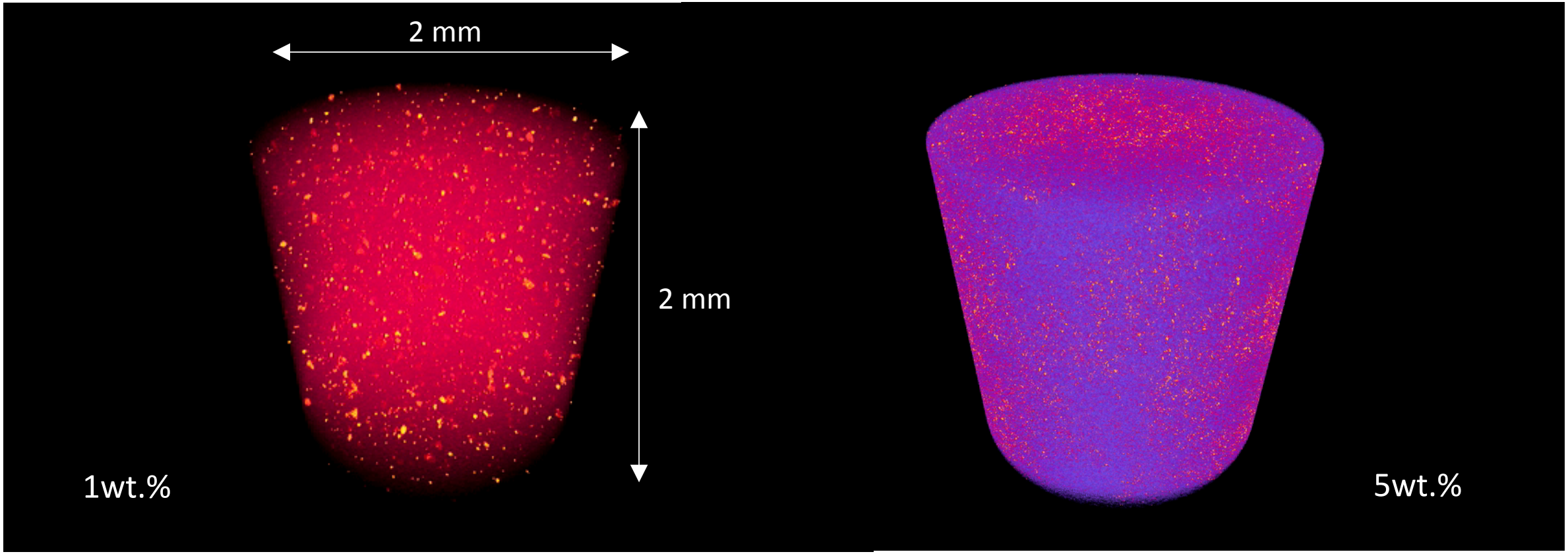
# Multifunctional nanocomposites

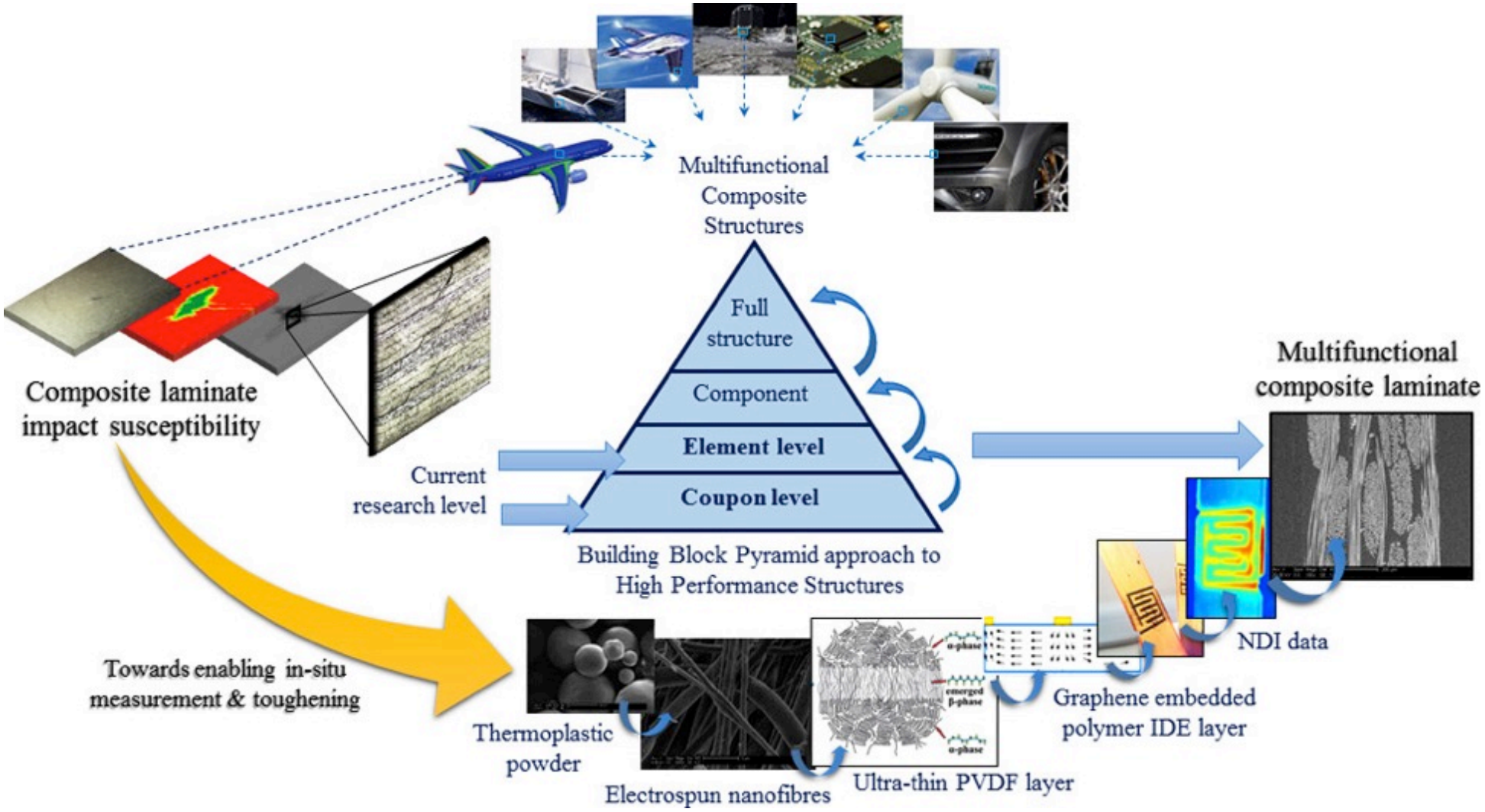
Smart structures: strain self-sensing, property tailoring




Nezhad and Thakur, Polymers. 2018, 10(10), 1106

# Enabling self-sensing as well as toughening

- Lotfian *et al*., J ACS Omega, 2018, *3* (8)
- An *et al*., J Mat. Today Chem, 2019, *14*



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# Funding from EPSRC by Research Areas

Materials Engineering £65M
Composite Materials £45M
Photonic Materials £76M
Polymer Materials £52M
Graphene £29M
Materials for Energy £59M
Biomaterials £69M
Functional Materials £59M

£ 0.5b

£ 5.4b


NATURAL FIBRES
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# …and Cars?

RIDICULOUS RIDES S5 • E6

Car-pentry: Man Spends $20,000 Building Wooden Concept Car

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# Circular Materials Manufacturing
# Sustainable Advanced Manufacturing

X


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### Continuous cast Rod

### Oxygen-free copper Rod

### Copper Online

Copper Online is Aurubis' copper price information service providing the latest copper price quotations.
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# THANK YOU

Professor Krzysztof K.K. Koziol
Cranfield University
School of Aerospace, Transport and Manufacturing
Building 61, Cranfield, Bedfordshire, MK43 0AL, United Kingdom

**k.koziol@cranfield.ac.uk**