



Advanced materials for multifunctional applications: Luminescence and light harvesting

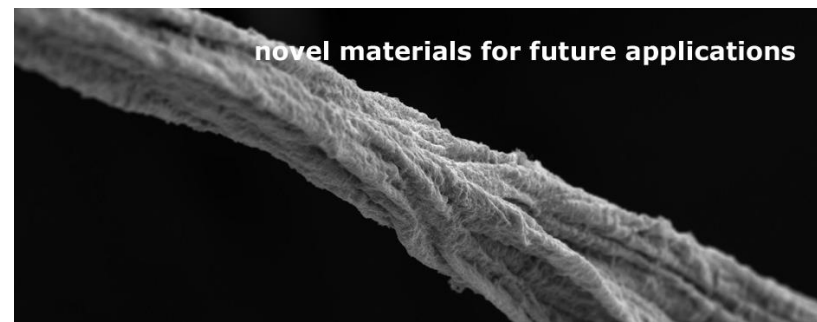
Workshop Aplicaciones de la luz para la industria aeroespacial

Instituto de la Ingeniería de España
March 28, 2017

*Miguel Ángel Rodiel
Technology Director*



The **IMDEA Materials Institute** (Madrid Institute for Advanced Studies of Materials) is a **non-profit independent research organization** promoted by the Madrid regional government **to perform research in Materials Science and Engineering.**



Belongs to the **IMDEA network**, an institutional framework created in 2007 to foster social and economic growth in the region of Madrid by promoting **talent attraction, excellence in research and technology transfer to industry** in a number of strategic areas (water, food, energy, materials, nanoscience, networks and software).

International reputation in the areas of **design, processing, characterisation and modelling of advanced materials** for applications in different industrial sectors with particular emphasis in **transport, energy and manufacturing.**

■ **≈120 researchers from 14 countries:** 16 researchers, 2 invited scientists, 19 post-doctoral researchers, 49 research assistants, 20 master students, 1 instrument scientist, 8 laboratory technicians .

- 50% of the researchers are foreign nationals
- 60% of the PhD were granted by foreign universities:

Spain: UPM, UCM, UPC, UPV, Autonomous University of Barcelona, University of Zaragoza, ...

Europe: Cambridge (2), Max Planck for Iron Research, Delft University of Technology, University of Leoben, Dublin City University, Dublin Institute of Technology, Università di Bologna, Université Catholique de Louvain, Katholieke Universiteit Leuven, etc.

America: University of California Berkeley, University of Maryland, Mississippi State University, State University of Campinas, ...

Asia: Seoul National University, University of Hyderabad, China Central South University, Sichuan University, University of Science and Technology of China, ...

Oceania: Monash University



Research programmes

TALENT



Strategic Partners



Microelectronics company



ABENGOA RESEARCH



Aerospace company



Advanced Materials for Multifunctional Applications

- Multifunctional Nanocomposites
(Dr. J. J. Vilatela, Program Leader)
- Photovoltaics and lighting and bio-LED
(Dr. R. Costa) from March 2017
- High Performance Polymer Nanocomposites
(Dr. D.-Y. Wang)
- Electrochemical Energy Storage Nanomaterials
(Dr. Vinod Etachery)
- Computational and Data-Driven Materials Discovery
(Dr. M. Haranczyk)





ScienceDaily®

Your source for the latest research news

Mobile Follow

Breaking News: A Strange Thi



SD Health Tech Environment Society Quirky

Science News

from research organizations

New LED with luminescent proteins

Date: January 12, 2016

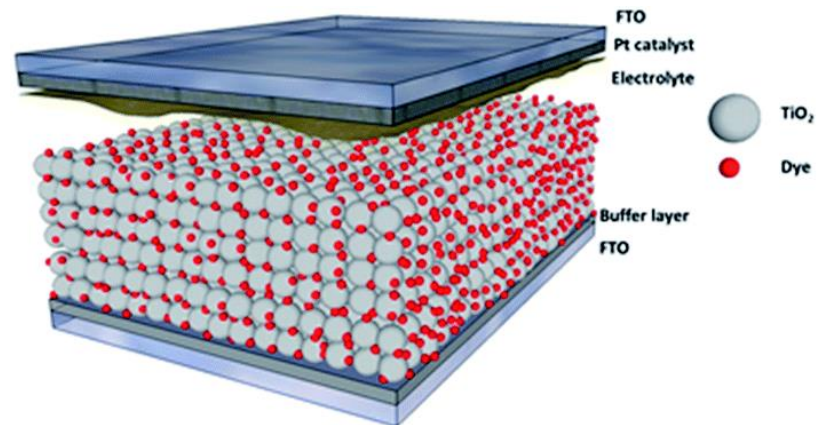
Source: Plataforma SINC

Summary: Scientists have discovered a way to create a BioLED by packaging luminescent proteins in the form of rubber. This innovative device gives off a white light which is created by equal parts of blue, green and red rubber layers covering one LED, thus rendering the same effect as with traditional inorganic LEDs but at a lower cost.

Share:

RELATED TOPICS

FULL STORY



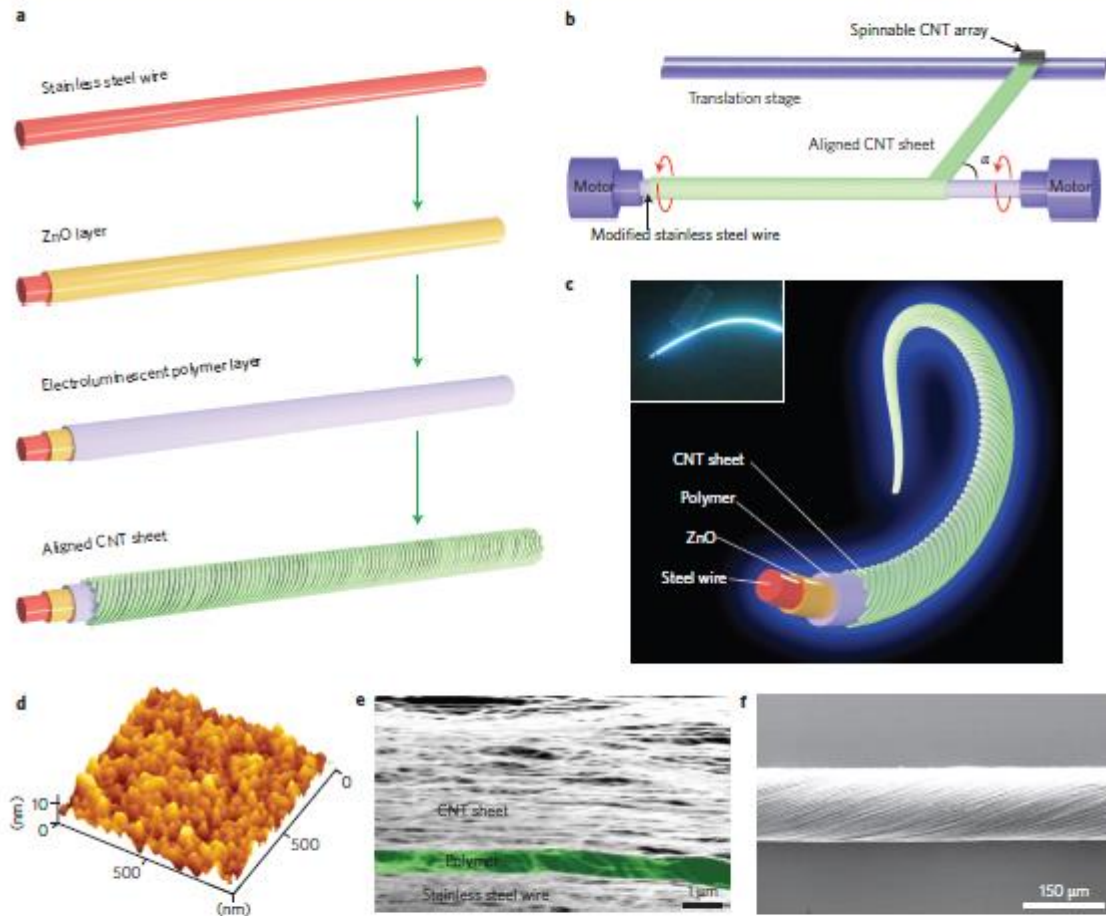


Figure 1 | Schematic illustration of the preparation and structural characterization of the PLEC. **a**, Schematic of fabrication of a fibre-shaped PLEC. **b**, Schematic of wrapping an aligned CNT sheet around a modified stainless steel wire. **c**, Schematic of the structure of a flexible fibre-shaped PLEC. Inset: photograph of a fibre-shaped PLEC biased at 10 V. **d**, AFM image of the polymer layer coated on the ZnO nanoparticle layer. **e**, SEM side-view image of a fibre-shaped PLEC. **f**, Aligned CNT sheet wrapped around the modified stainless steel wire with an angle of 15°.



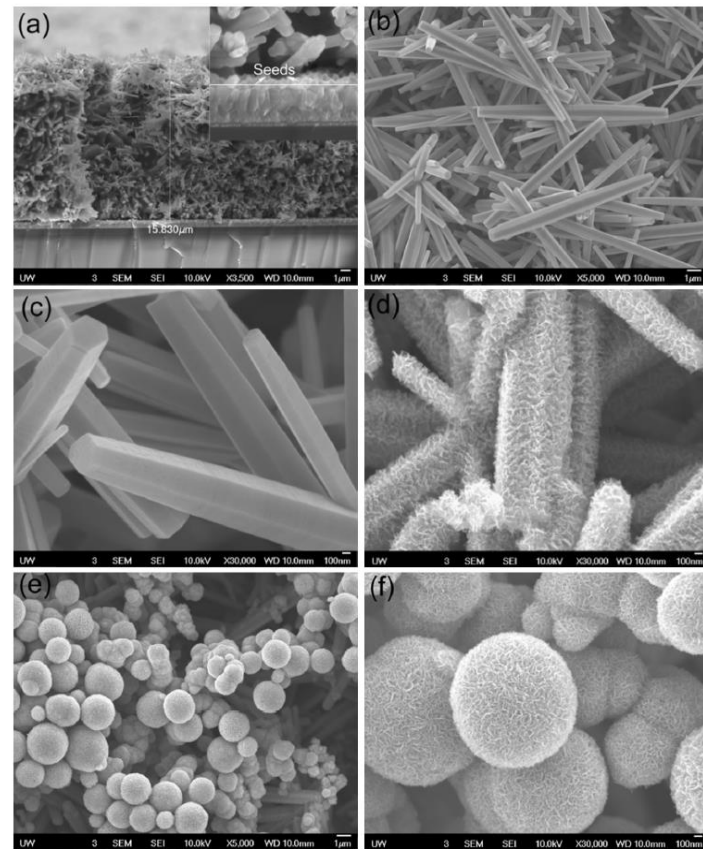
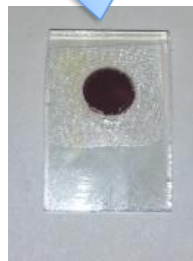
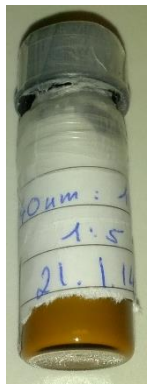
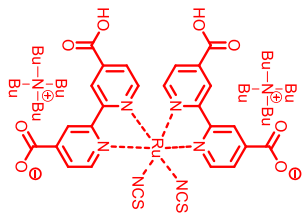


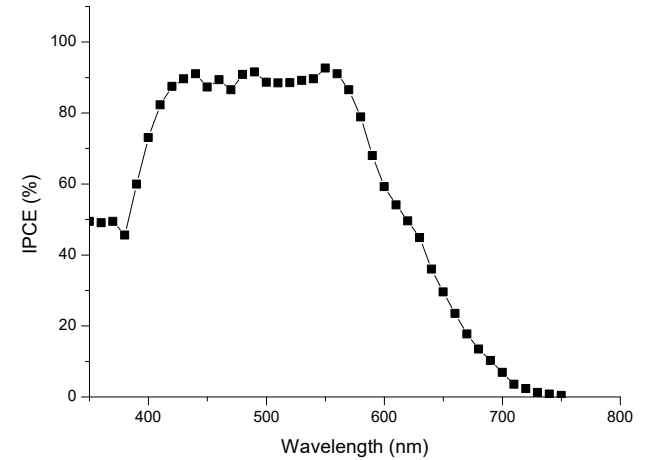
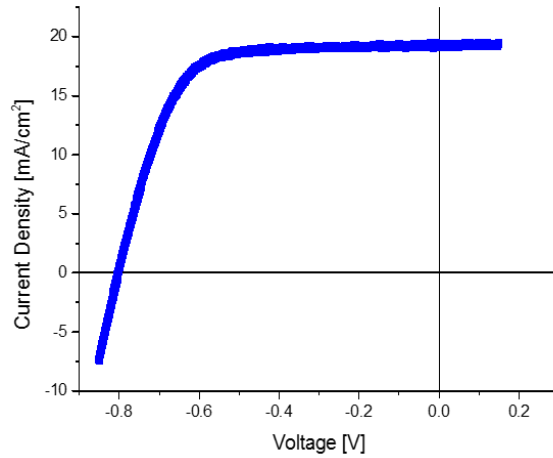
Photovoltaics, luminescence and bio-LED

The electrode is a mesoporous metal oxide based semiconductor film.

n-type electrode: TiO₂ or ZnO

p-type electrode: NiO or CuO





$$\eta = V_{OC} \times J_{SC} \times FF = 11.20 \%$$

Under illumination under 1.5 AM condition (100 mW/cm²)

Scalable assembly processes

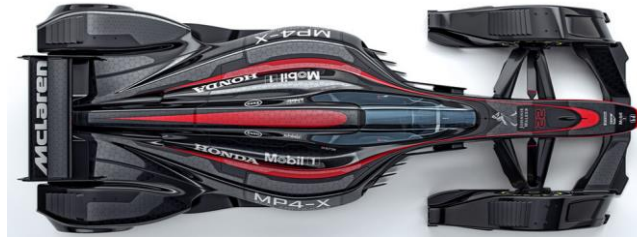


Established trends in multifunctional materials

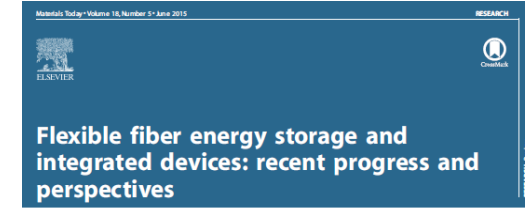
Electrification of transport



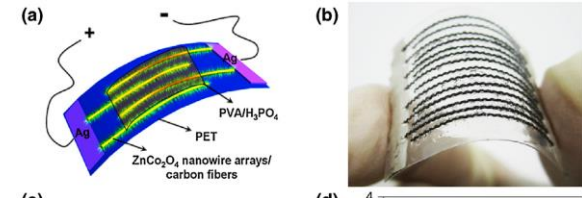
Energy harvesting & storage



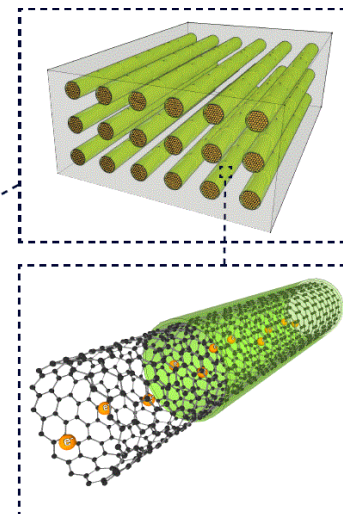
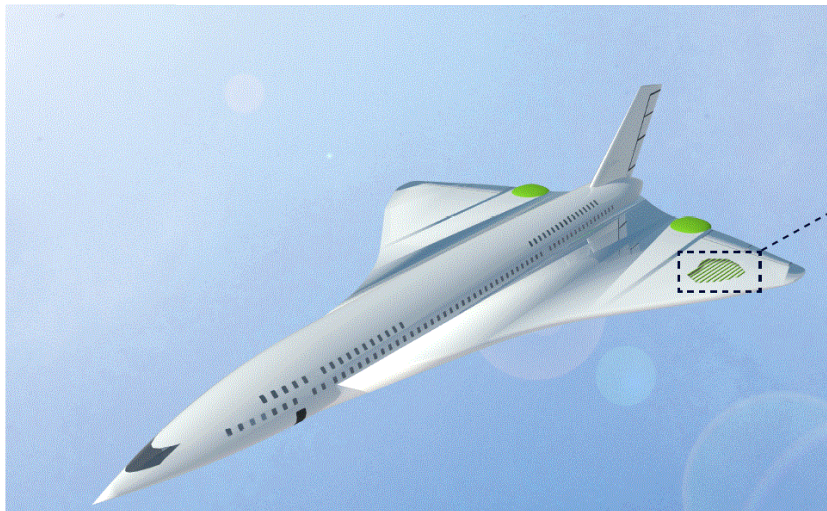
Tough electronics (wearable, flexible, etc)



Xianfu Wang¹, Kai Jiang^{2,*} and Guozhen Shen^{1,*}



Structural composite materials for energy harvesting and storage



Current partners

Expressions of interest
and possible partners





institute
imdea
materials

miguel.angel.rodriel@imdea.org

www.materials.imdea.org