INFODAY:
Programma LIFE 2021-2027
"I fondi europei e la loro integrazione per la biodiversità e la transizione green del territorio"

Lignocellulose-based biotemplate from bamboo biomass for chemical, electric and electrochemical biodevices

Biomassa Lignocellulosica di Bambù per dispositivi chimici, elettrici e elettrochimici

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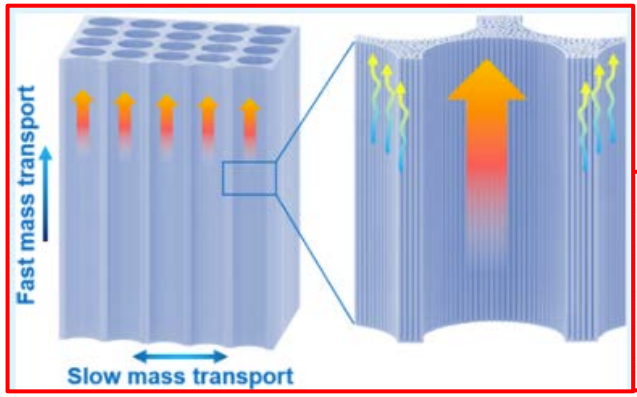
FCN RESEARCH GROUP

Genova, 23 maggio 2022

State-of-the-art for wood-based devices



CHEMICAL REVIEWS
Review
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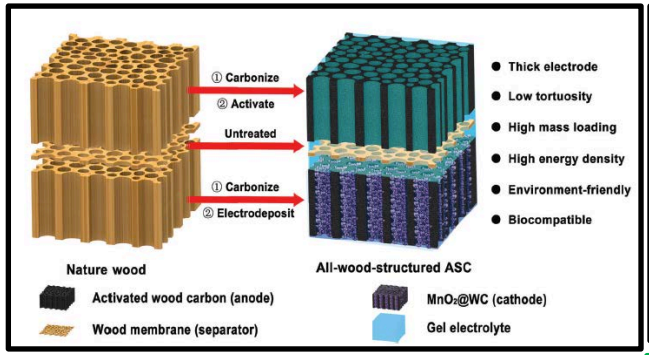
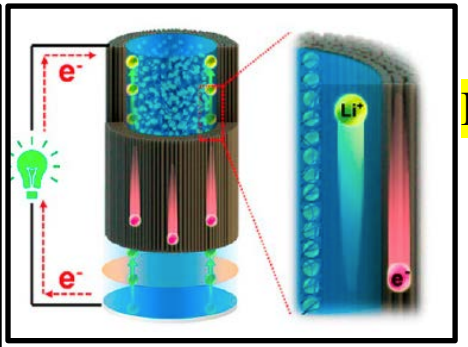
Wood-Derived Materials for Green Electronics, Biological Devices, and Energy Applications

Hongli Zhu,*[,†,‡,§] Wei Luo,[†,§] Peter N. Ciesielski,[∥] Zhiqiang Fang,[†] J. Y. Zhu,[⊥] Gunnar Henriksson,[#] Michael E. Himmel,[∥] and Liangbing Hu*[,†]

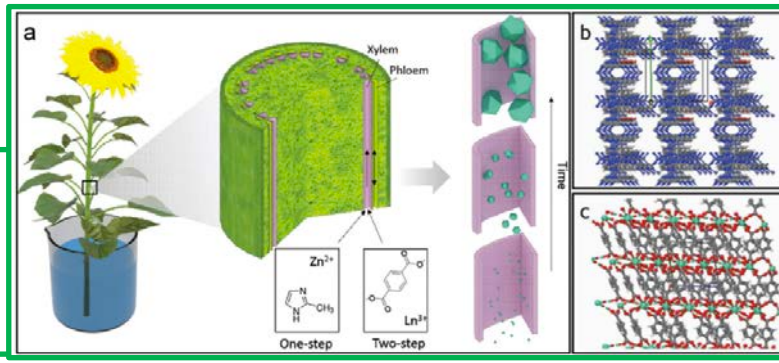
Anisotropic, Mesoporous Microfluidic Frameworks with Scalable, Aligned Cellulose Nanofibers

Chao Jia,[†] Feng Jiang,[†] Piao Hu,[‡] Yudi Kuang,[†] Shuaiming He,[†] Tian Li,[†] Chaoji Chen,[†] Alan Murphy,[†] Chunpeng Yang,[†] Yonggang Yao,[†] Jiaqi Dai,[†] Christopher B. Raub,[§] Xiaolong Luo,[‡] and Liangbing Hu*[,†]





Highly Wood-derived materials for Super capacitors, electrodes & battery



Nano-Biohybrids: In Vivo Synthesis of Metal–Organic Frameworks inside Living Plants

Joseph J. Richardson and Kang Liang**

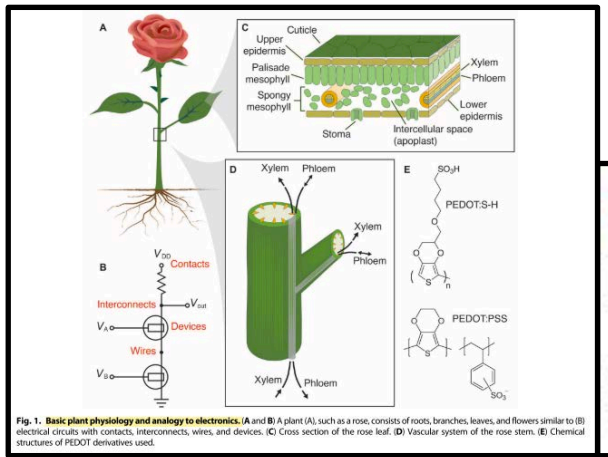


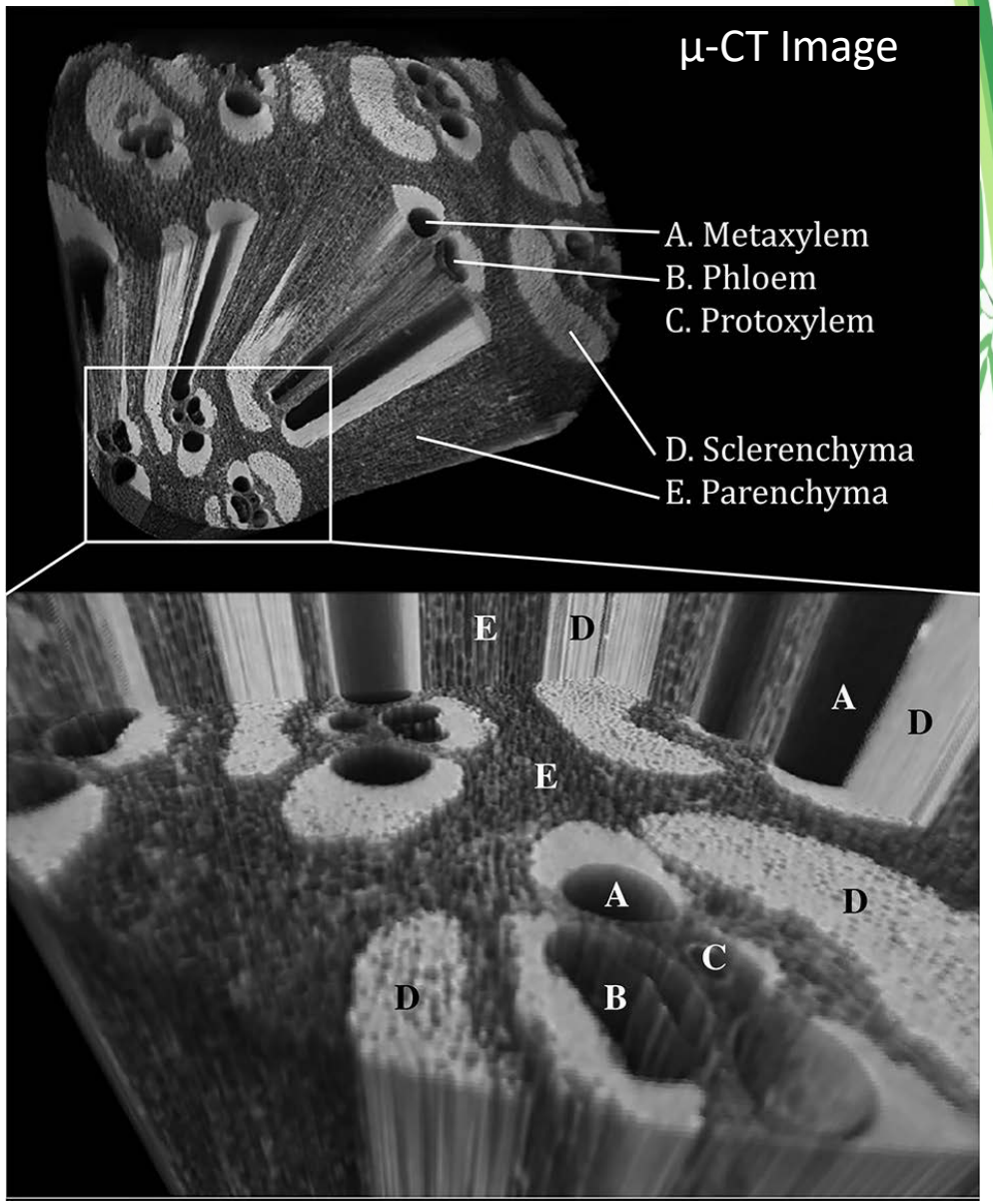
Fig. 1. **Basic plant physiology and analogy to electronics.** (**A** and **B**) A plant (A), such as a rose, consists of roots, branches, leaves, and flowers similar to (B) electrical circuits with contacts, interconnects, wires, and devices. (**C**) Cross section of the rose leaf. (**D**) Vascular system of the rose stem. (**E**) Chemical structures of PEDOT derivatives used.

ELECTRONICS

Electronic plants

Eleni Stavrinidou,[1] Roger Gabrielsson,[1]* Eliot Gomez,[1]* Xavier Crispin,[1] Ove Nilsson,[2] Daniel T. Simon,[1] Magnus Berggren[1]†

Why to use Bamboo?



Bamboo-Biomass' Characteristics:

- ***Abundance and low cost lignocellulose natural resource***
- ***Renewable, Biodegradable and biocompatible biomaterial***
- ***Sustainable scalability production of biodevices***
- ***High mechanical strength & Light weight***
- ***High crystallinity of cellulose fiber (D)***
- ***Conductive Graphitic carbon if pyrolyzed > 900˚C (D)***
- ***Anisotropic and hierarchical lignocellulose structures***
- ***Natural template for Microarray Channels System (A)***

O.G. Pandoli et al.; *RSC Adv.*, 2016, 6, 98325

ACS Sustainable Chemistry & Engineering

Research Article

Cite This: *ACS Sustainable Chem. Eng.* 2019, 7, 3267−3273

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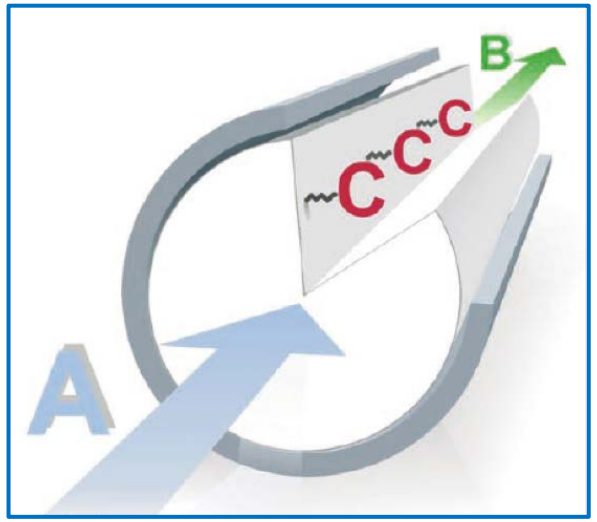
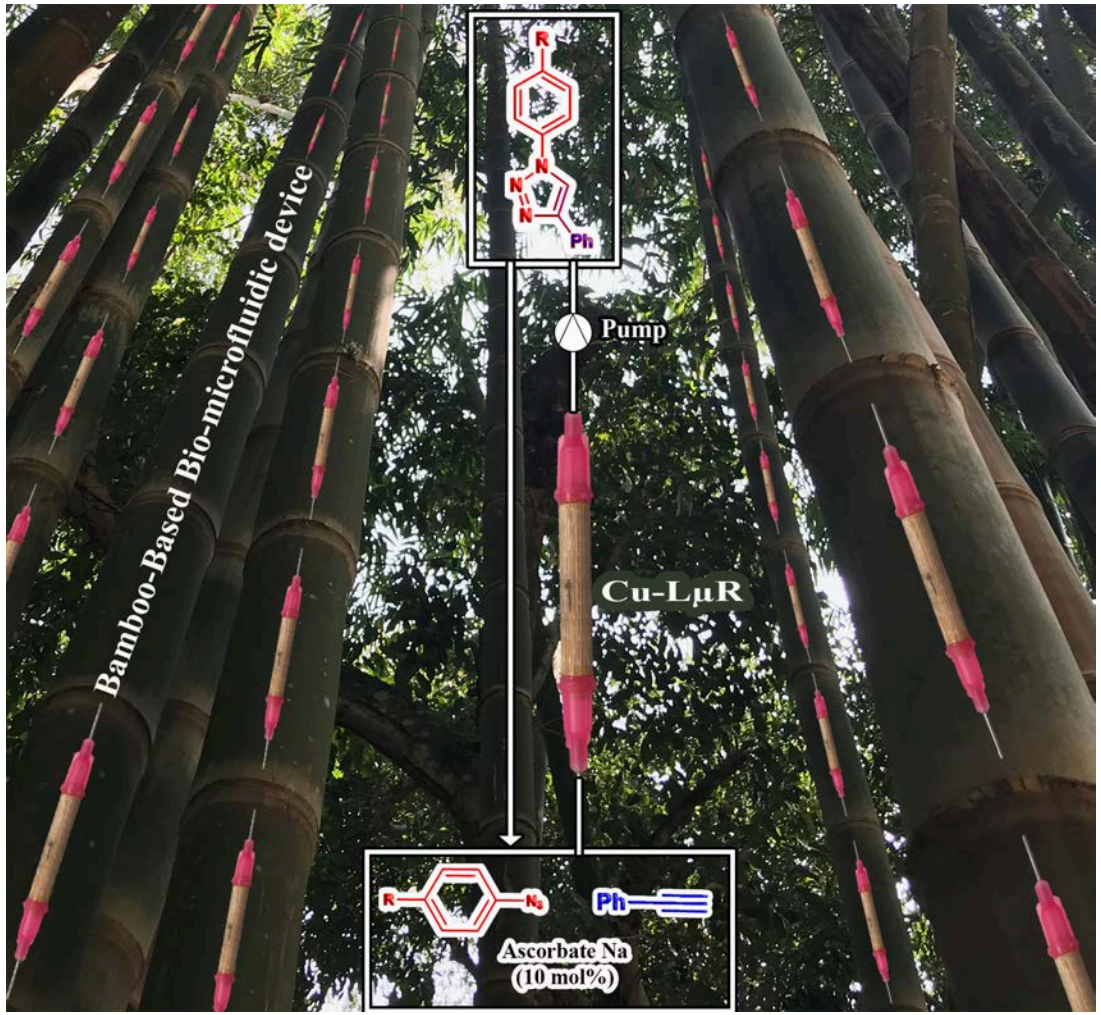
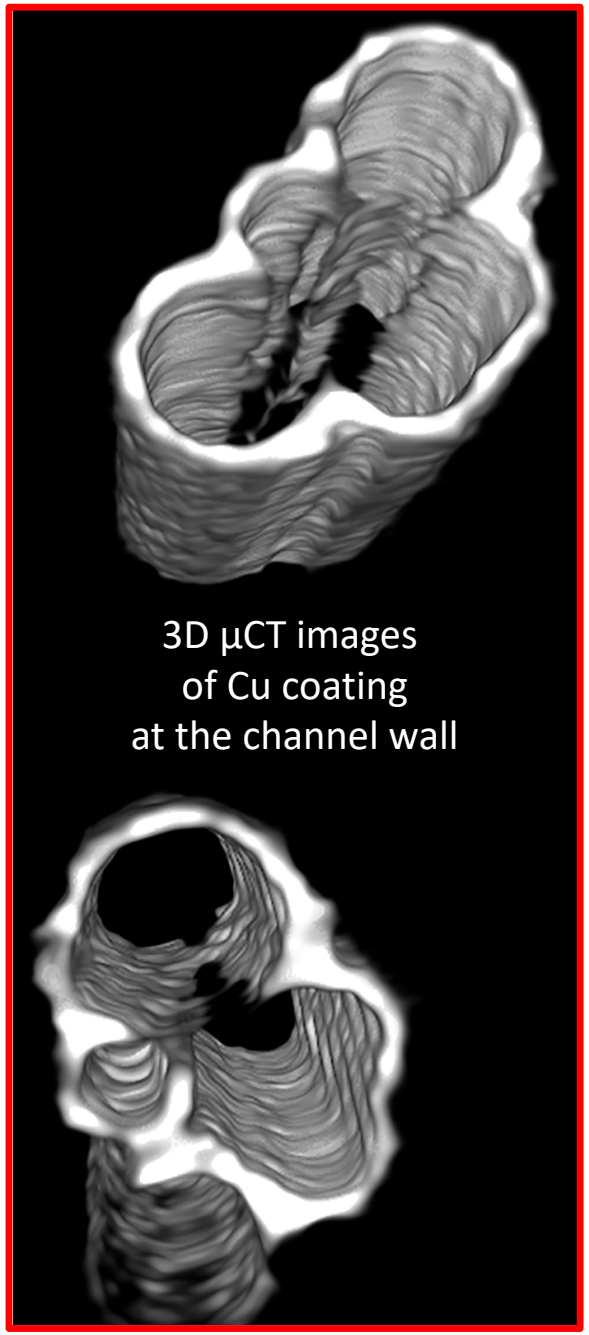
Fabrication of Lignocellulose-Based Microreactors: Copper-Functionalized Bamboo for Continuous-Flow CuAAC Click Reactions







O. G. Pandoli et al. *ACS Sustainable Chem. Eng.* (2019)

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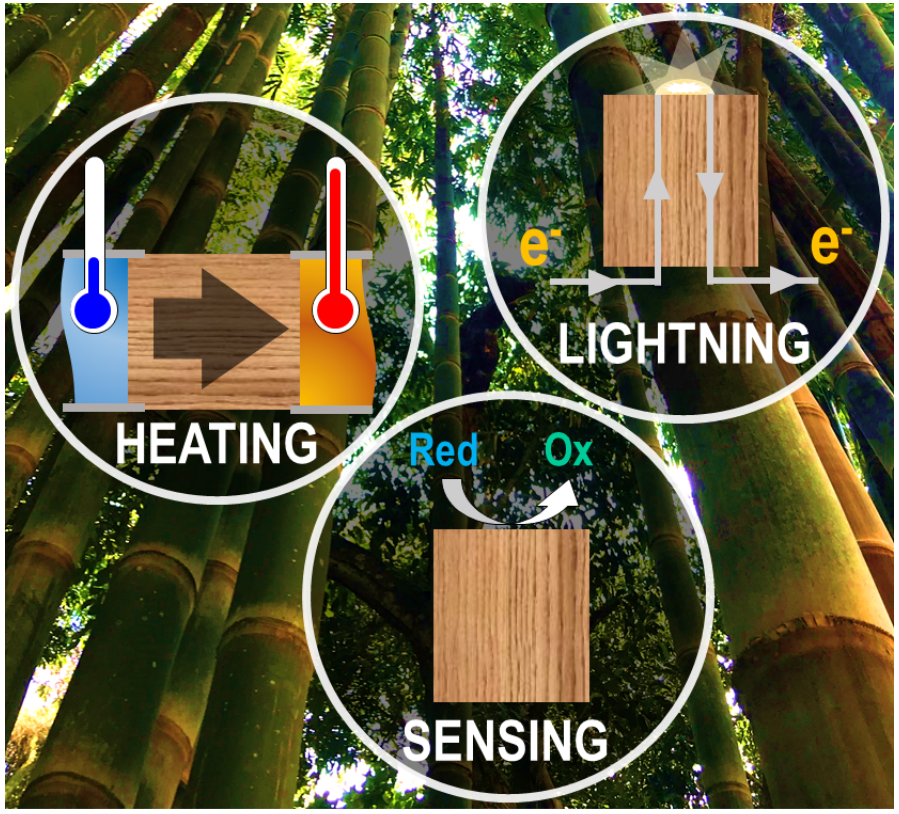
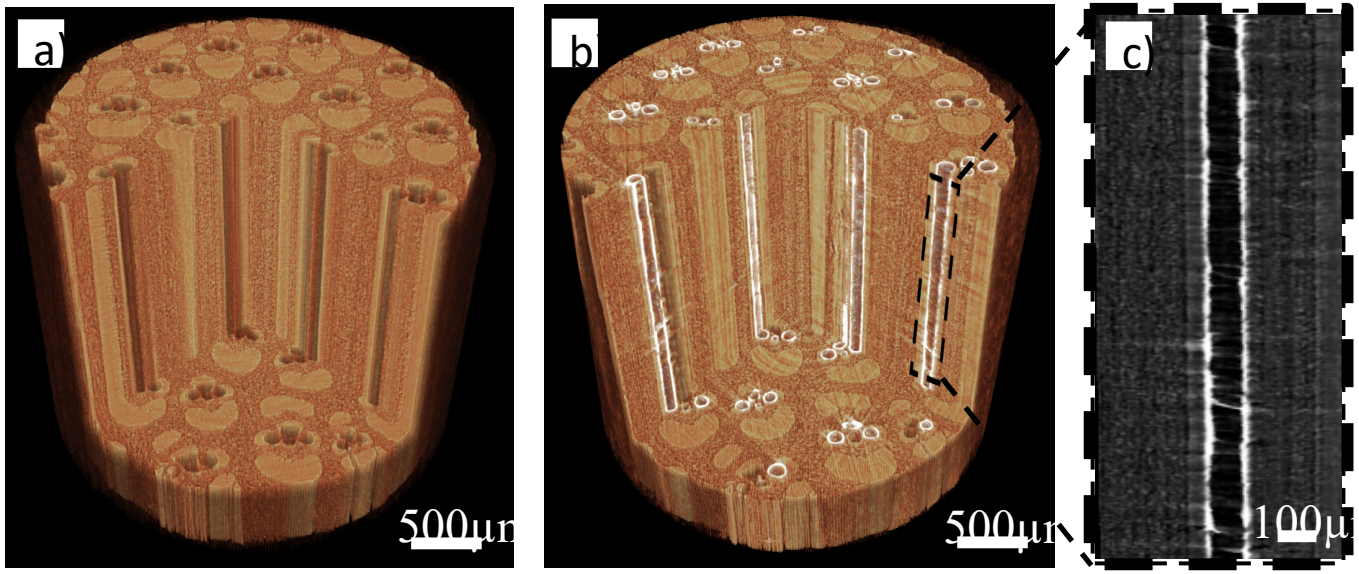


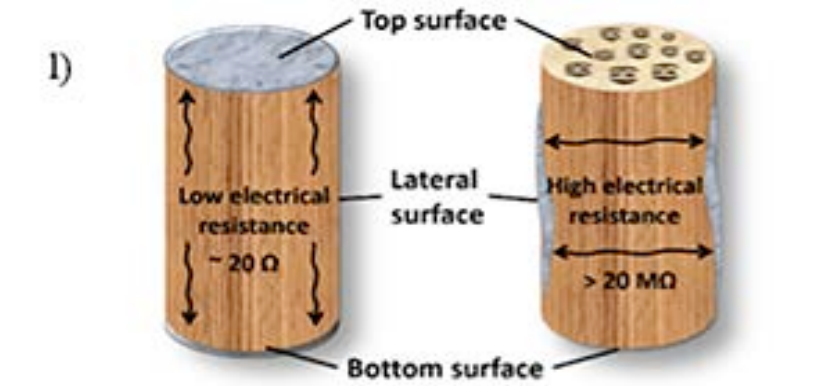
Ultra-highly conductive hollow channels guided by a bamboo bio-template for electric and electrochemical devices†

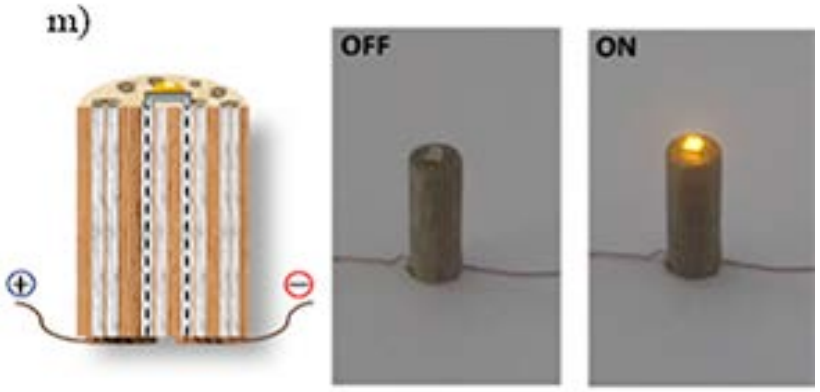
Omar G. Pandoli, *[a] Reginaldo J. G. Neto,[b] Natália R. Oliveira,[b] Ana C. Fingolo,[b] Cátia C. Corrêa,[b] Khosrow Ghavami,[a] Mathias Strauss *[bc] and Murilo Santhiago *[bc]

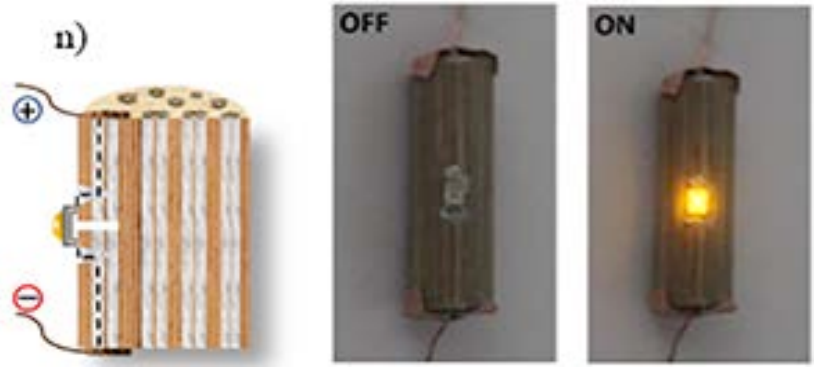


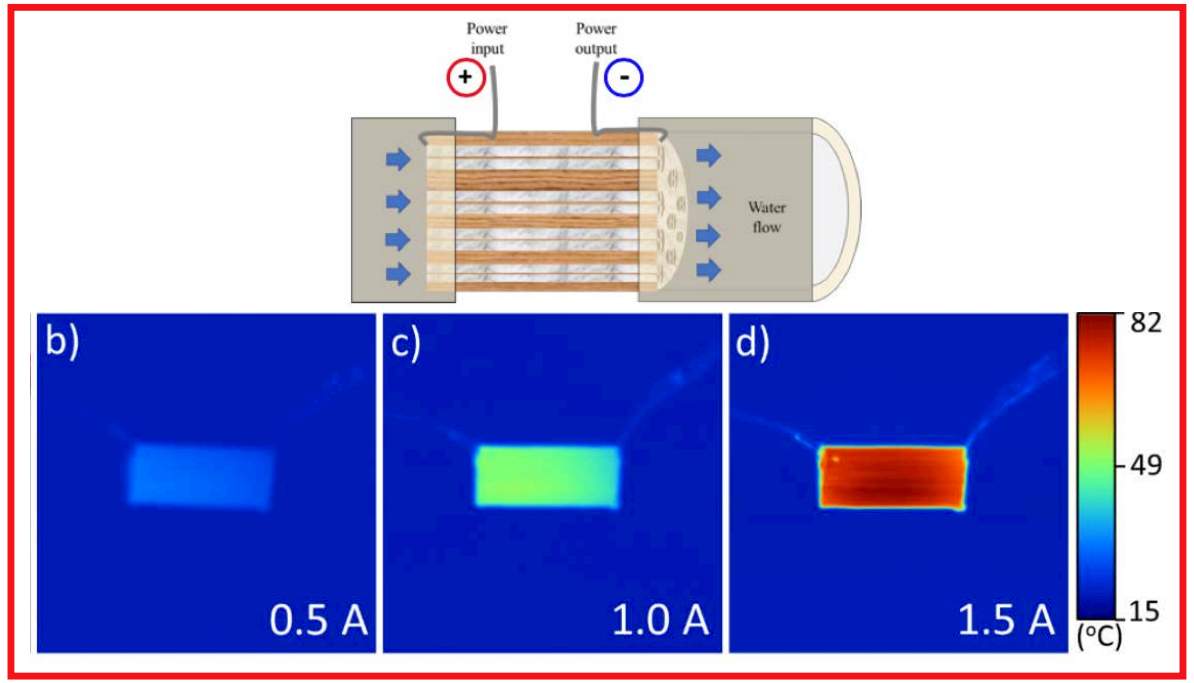
Next generation of electric and electrochemical *"bambootronics"* bio-devices

3D electrical circuits

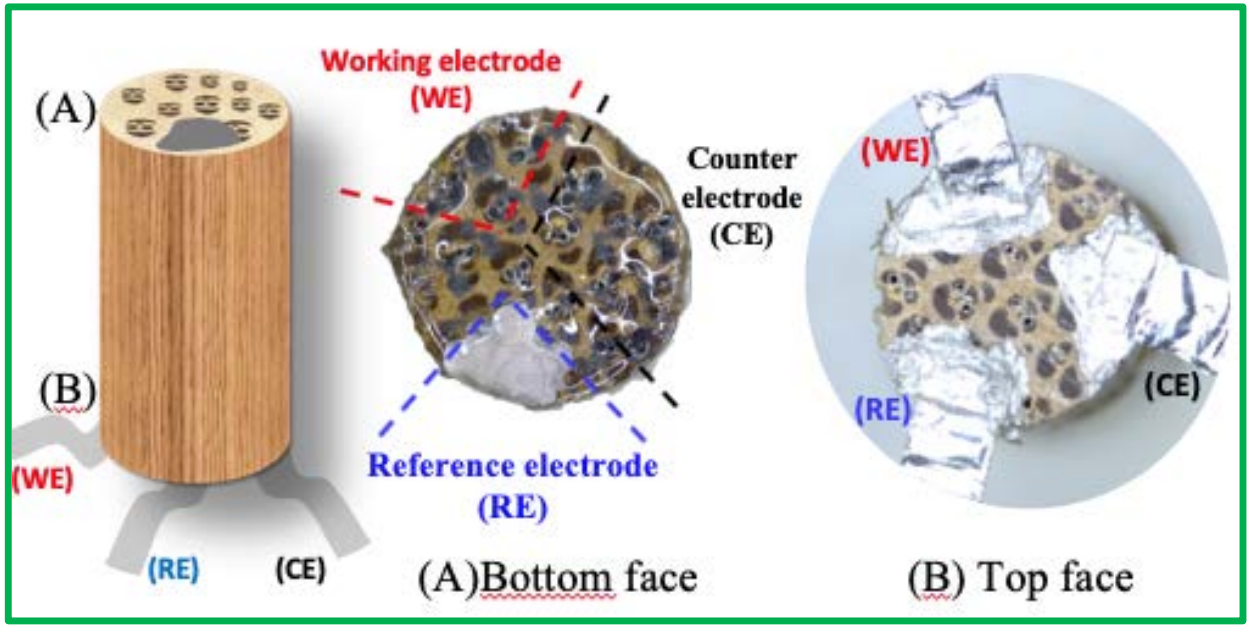








Microfluidic multi-channel Heater

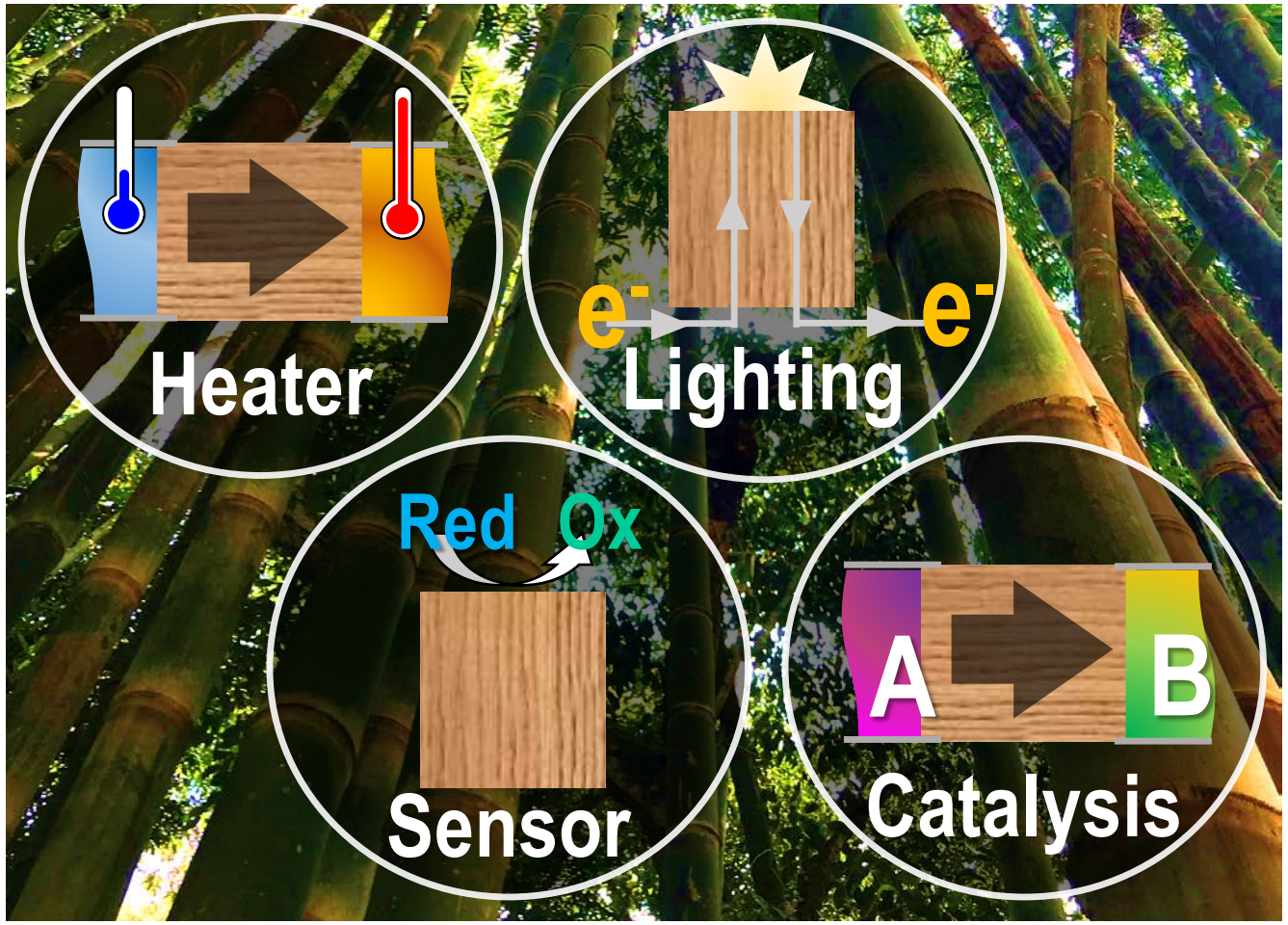


Full-integrated electrochemical Cell

Conclusions:

We demonstrated a fast and easy prototyping of catalytic and conductive Bamboo's hollow microchannels array using bamboo as a bio-template for the next generation of chemical, electric and electrochemical *"bambootronics"* biodevices.

we developed a bamboo-based chemical microfluidid device, different 3D electric circuits, microfluidic heater and fully-integrated nanostructured carbon-based electrochemical cells.



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Problema futuro: purificazione dell'acqua con materiali sostenibili

Soluzione: uso di dispositivi elettrochimici lignocellulosici derivati dalla biomassa di bambù come nuove piattaforme sostenibili per la bonifica delle acque.

Section 01 ENVIRONMENT (Ambiente):
Sub-Programme NATURE AND BIODIVERSITY (Natura e Biodiversità)
Sub-Programme CIRCULAR ECONOMY AND QUALITY OF LIFE (Economia circolare e qualità della vita)

- SAP - STANDARD ACTION PROJECTS (Progetti di Azione Standard): Progetti eleggibili per tutti e 4 i Sottoprogrammi sopra citati. Rappresentano i "progetti tradizionali" della precedente edizione Life e mirano a sviluppare, dimostrare e promuovere tecniche, metodi e approcci innovativi; contribuire alla base di conoscenze e all'applicazione di best practice; sostenere lo sviluppo, l'attuazione, il monitoraggio e l'applicazione della legislazione e della politica dell'UE. Possono essere progetti 'close-to-market' (orientati al mercato). Il cofinanziamento UE max dei SAP è 60%, ad eccezione dei progetti SAP Natura e Biodiversità che possono raggiungere il 67% o il 75% (a seconda delle tipologie di habitat e specie prioritarie toccate). La durata massima dei SAP è 10 anni.