



Towards Sustainable Bioeconomy

SmartBIO Annual Meeting

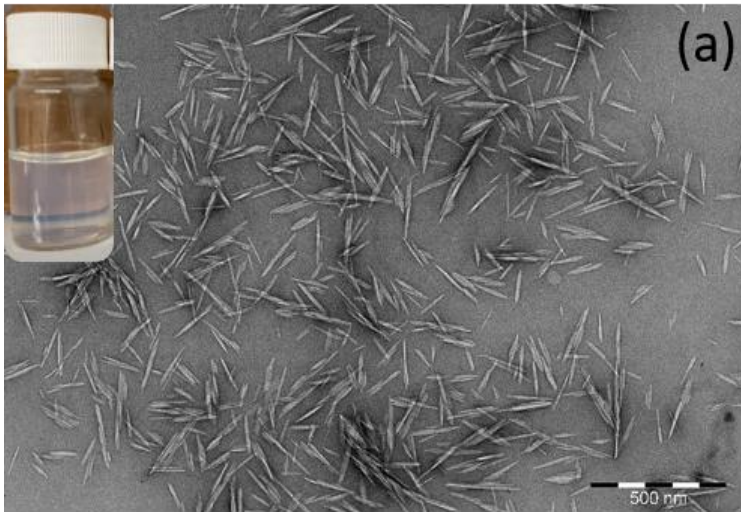
Electrochemistry and electroactive materials

Johan Bobacka, ÅAU

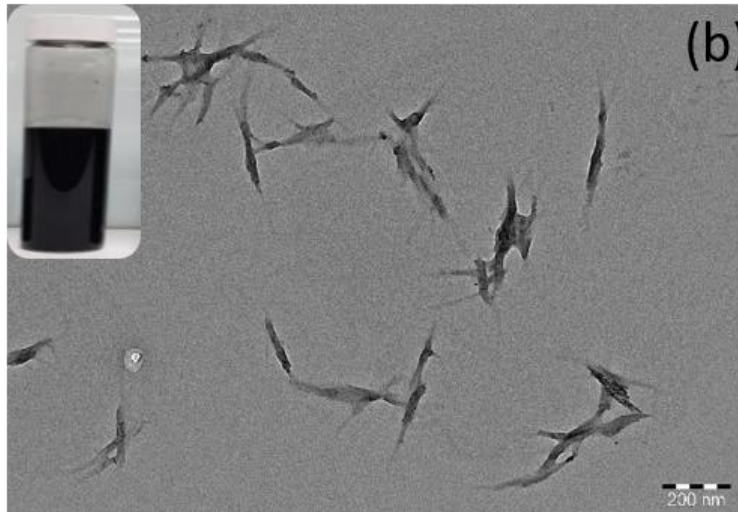
26.10.2022

Electrically conductive nanocomposite of nanocellulose and polypyrrole for fabricating 2D membranes or 3D hydrogels

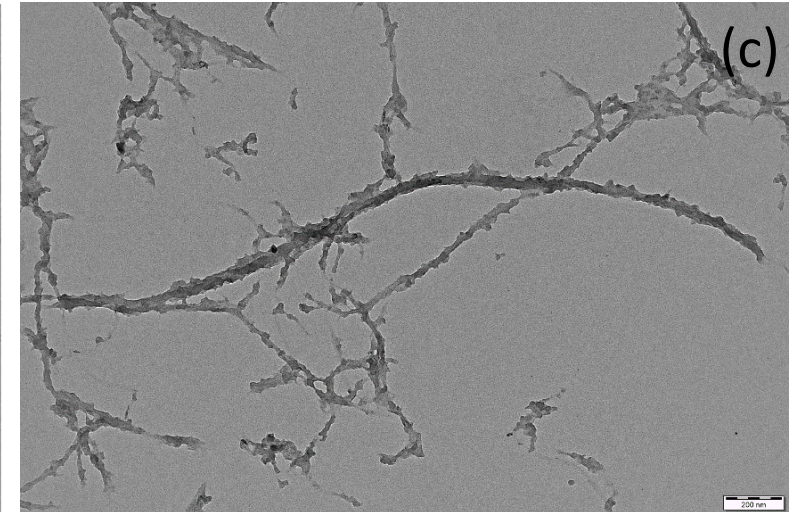
Pharmaceutical Sciences, Natural Materials Technology, Analytical Chemistry



Cellulose nanocrystals



Cellulose nanocrystals
coated by polypyrrole



Cellulose nanofibrils
coated by polypyrrole

Lead Researchers:

Dr. Xiaoju Wang

Dr. Rose-Marie Latonen

Applications:

- 1) Energy storage devices
- 2) Biointerfaces for endogenous electrical stimulation

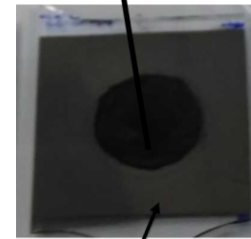
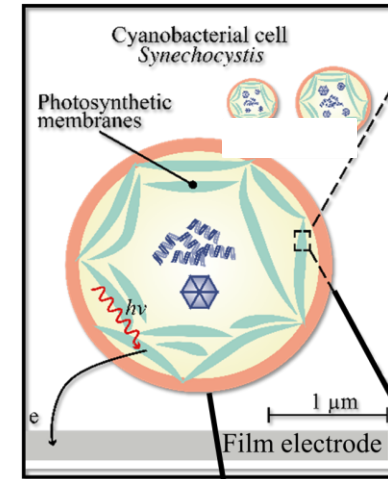
Shear exfoliated and spray-coated few-layer graphene films as sustainable anodes for a biophotovoltaic device

- Spray-coated graphene and graphene-CNC composite films are coated with cyanobacteria and used as an anode in a biophotovoltaic (BPV) cell
- Cyanobacteria convert solar energy into electricity
- Graphene and graphene-CNC films are sustainable and biocompatible with the cyanobacterial cells
- Graphene and graphene-CNC feature nano-roughness, porosity and high electron transfer efficiency

UTU: Prof. Yagut Allahverdiyeva-Rinne,
Dr. Laura T. Wey

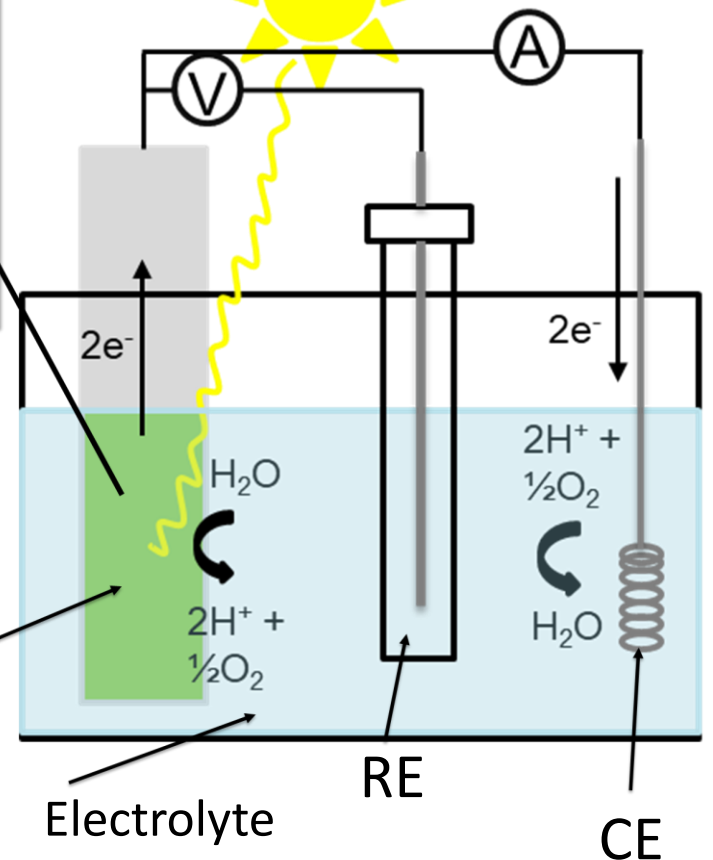
UTU & ÅAU: MSc Sara Lund

ÅAU: Dr. Rose-Marie Latonen, Prof. Johan Bobacka,
Dr. Xiaoju Wang, MSc Qingbo Wang



Working electrode:
Synechocystis biofilm
on graphene or
graphene-CNC film

Three-electrode photobioelectrochemical cell



Development of sustainable technologies for electrical energy storage based on biomaterials and 3D printing (SUSTEC)

Johan Gadolin Process Chemistry Centre

- **Motivation:** The increasing use of wind and solar energy creates an enormous need for batteries to store electrical energy for mobile and stationary applications.
- **Challenge:** The **limited sources** of currently used battery metals, such as **Li**.
- **Goal:** The goal is to develop **sustainable sodium (Na)-ion batteries** by utilizing **renewable wood-derived materials** and **3D printing**.
- **Duration:** 4 years (1.9.2022 – 31.8.2026)
- **Funding:** Jane and Aatos Erkko Foundation (1 M€)

MSc Angelo Robiños, Dr. Hao Zhang, Dr. Zekra Mousavi, Prof. Chunlin Xu,
Prof. Johan Bobacka, Prof. Leena Hupa, Tor Laurén



JANE JA AATOS
ERKON SÄÄTIÖ

Sustainable use of biomass



Aboa Tech Talks – Webinar 4.11.2022

Sustainable use of biomass

- 09:00** Welcome and introduction, Johan Bobacka (ÅA)
09:10 Novel materials from trees towards sustainable packaging, Chunlin Xu (ÅA)
09:30 Unlocking the potential of algae for a sustainable bioproduction, Yagut Allahverdiyeva-Rinne (TY)
09:50 From biomass to biogas, Andreas Willfors (Novia)
10:10 Development and utilization of biocomposites and bioplastics, Liisa Lehtinen (TuAMK)
10:30 From waste to value – Biomass fractionation, Lari Vähäsalo (CH-Bioforce)
10:50 Discussion
11:00 End

Join via Zoom:

<https://aboakademi.zoom.us/j/62344281840>

