

ENCONTRO EFS 22

ALUNOS ♦ EMPRESAS

Three dimensional biosensors for harvesting bioelectricity in cell cohorts

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Motivation and Objectives

The aim of this project is to create a self-sustainable bioenergy generator, with an output power of the order of W/m² that is at least 100 times larger than current state-of-art bioenergy generators.

The unprecedented enhancement in output power finally breaks the power scalability barrier for bioenergy generators and in this way delivers impact on the world's renewable energy research trajectory.

Currently, my professor discovered that a population of diatoms, a form of algae, communicate in a cooperative manner and produce long lasting large magnitude electrical oscillations.

Work plan

- 1) To seek materials and 3D electrode geometries comprise larger cell densities and enable a more efficient charge transfer from the living organisms to the electrode;
- 2) To select organisms which provide higher output powers;
- 3) Electric circuitry will be developed to store and deliver the generated power measurements .

Results

For now, the foams selected were measured and they demonstrated different pore size dimensions, characteristics as well, which turns relevant for future applications depending on the size of the cells. Regarding conductivity, the polymer ink CNT shown 20% more absorption of coating adhered in the foams than using PEDOT:PSS. The next step will be to test the biocompatibility of these coatings with algae cells.



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First Year: PhD Student in Sustainable Energy Systems

- Master Student in Energy for Sustainability in 2020/2021 at U. de Coimbra
 - Postgraduate in Labor and Safety Engineering in 2019 at U. Cândido Mendes
 - B. Sc. Electrical Engineering in 2016 at the Faculdade Brasileira
- Main research interests: Energy, Bioenergy, Bioelectronics

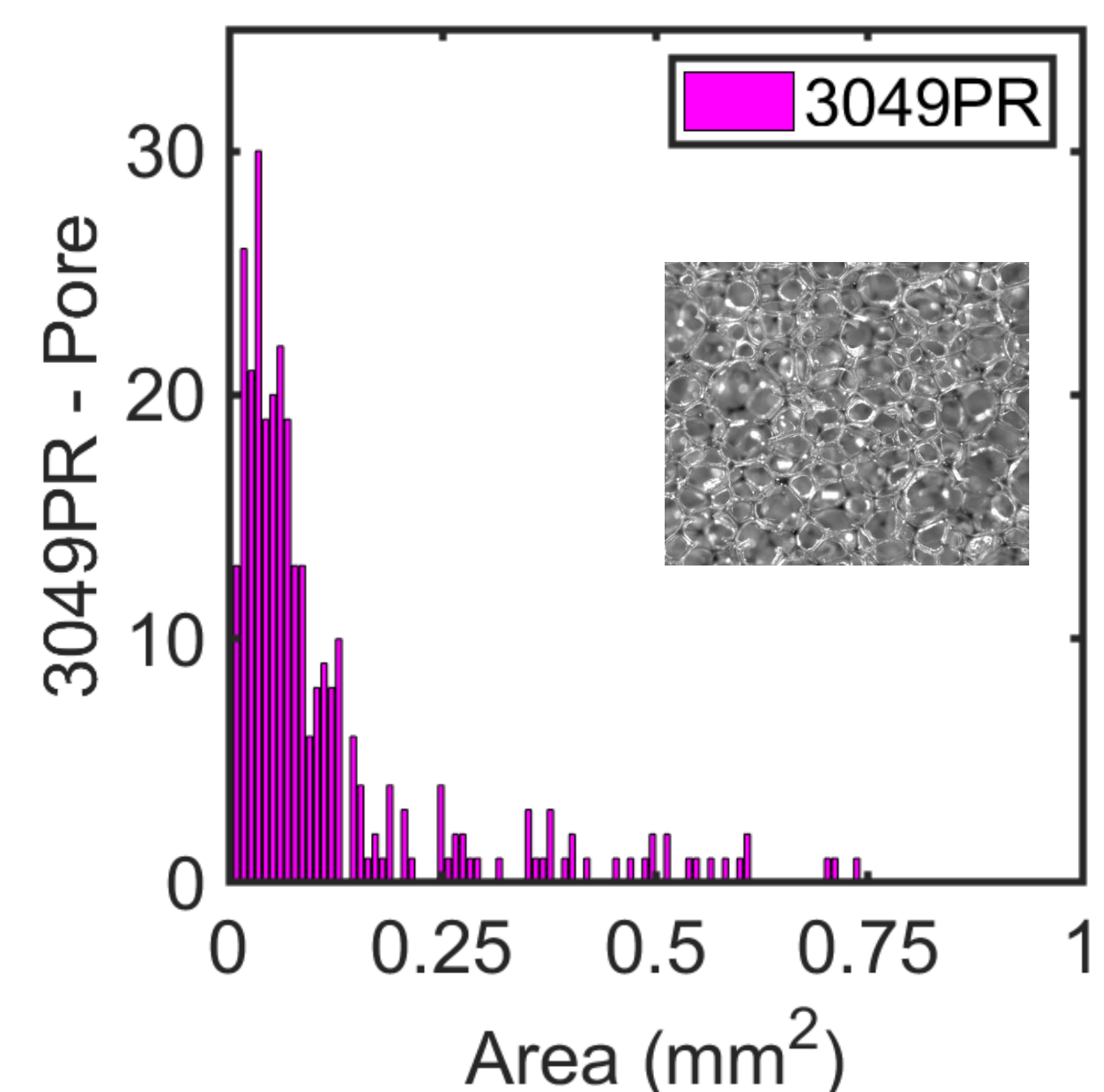


Figure 1 – Histogram of a named sponge: 301 points measured

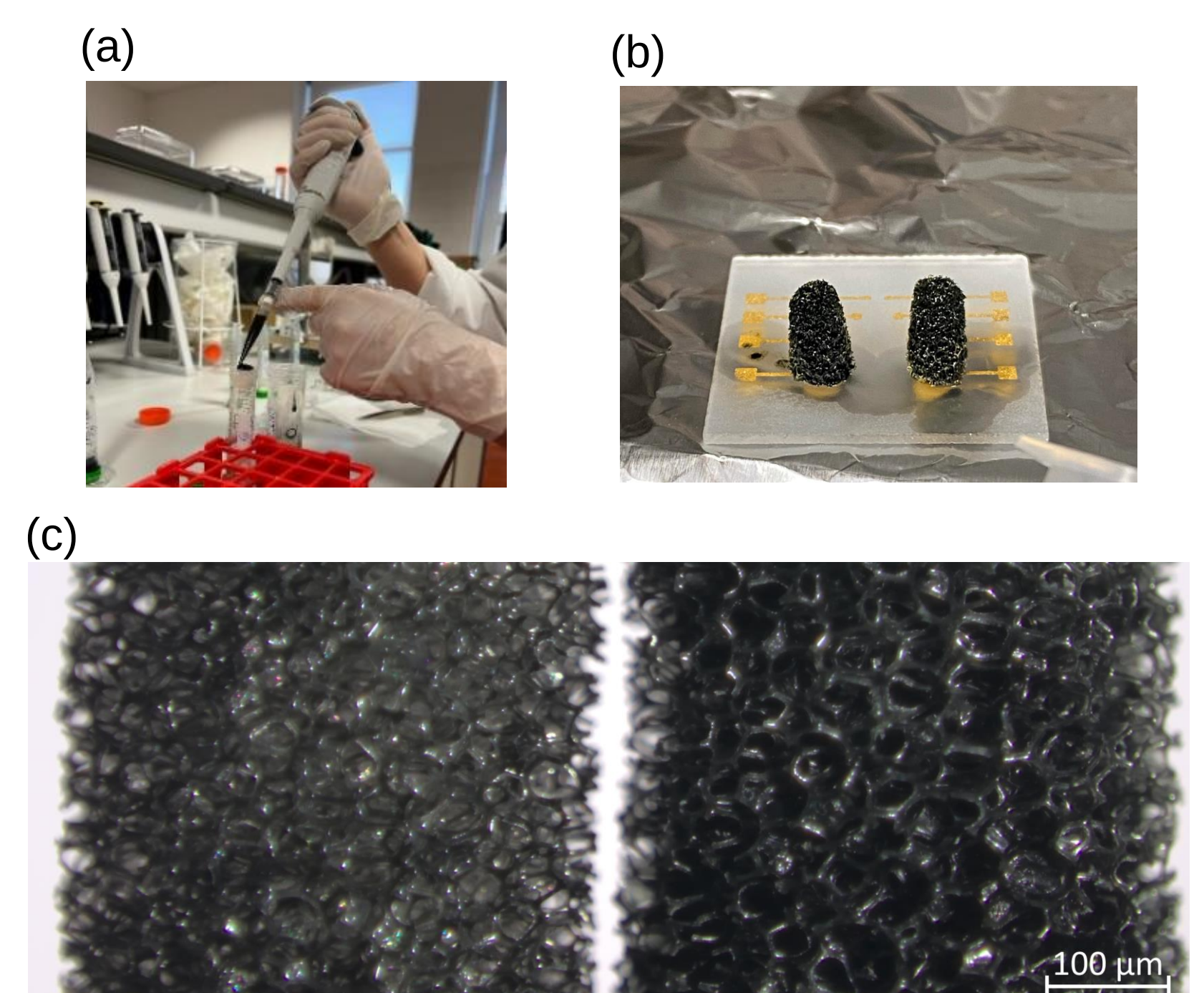


Figure 2 – Coating process of 3D sponges.
 (a) picture of drop casting 3ml of Coating solution
 (b) picture of 3D sponges inside the muffle to heat dry
 3D sponges coated 140 °C for 1h and
 (c) Brightfield images of sponges after drying: PEDOT:PSS and CNT. Scale bar is 100µm.