PO043

CARBON NANOMATERIALS FOR ELECTRODE MODIFICATION IN CH_4-PRODUCING BIOELECTROCHEMICAL SYSTEMS

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Introduction: Unprecedented environmental phenomena have led to emerging and challenging plans to tackle global threats for the humanity namely intensive use of fossil resources and global warming. CO_2 emission to the atmosphere is one of the major driver of global climate change. In this context, the development of alternative technologies for carbon capture and utilization has attracting more and more attention. Electrochemically assisted CO_2 conversion in bioelectrochemical systems (BESs) for CH_4 production is a new and emerging technology. This innovative approach allows the storage of electrical renewable energy in the form of CH_4 that can, when needed, be reconverted, but also the simultaneous CO_2 capture contributing to mitigate the climate change and the global warming. However, this technology has limitations mainly related to the electrons transference between the electrode and the biocatalysts. Previous results, obtained within the research group, demonstrated that it is possible to increase the efficiency of the process by improving the electrode surface area which, in turn, improved the microbial attachment.

Methodology: This work aimed to investigate the effect of the presence of carbon nanomaterials (carbon nanotubes (CNTs)) at the cathode, on the CH_4 production via CO_2 reduction. It was hypothesized that the presence of carbon nanomaterials will improve the electrode surface area, thus increasing the electron transfer between the electrode and the biocatalysts. The production of CH_4 was analyzed in two BESs, one working with a modified electrode (BES-CNT) and another one that works as a control with a non-modified electrode (BES-CTRL). The potential of CNTs to improve CH_4 production was investigated under different electrochemical control modes, potentiostatic and galvanostatic. In addition, the microbial community developed at the biocathode was also investigated.

Results: The results demonstrated that for both electrochemical control modes, the production of CH_4 was higher in the presence of CNTs compared to the control assay. The study of the microbial community developed at the biocathode under galvanostatic control demonstrated a clear enrichment of methanogens compared to the initial inoculum, however no significant differences were observed between both BES.

Conclusions: In conclusion, this work contributed with preliminary insights on the effect of carbon nanomaterials, namely CNTs, to improve the biocathode performance on BESs for CH_4 production from CO_2.

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