Porous nickel hollow fiber cathodes coated with CNTs for efficient microbial electrosynthesis of acetate from CO₂ using Sporomusa ovata

Impact
- Microbial electrosynthesis (MES) allows recycling of CO₂ into value added products by coupling renewable energy to the microbial ability for complex product formation.
- To improve the rates of product generation, porous nickel hollow fibers (Ni-PHF), for facilitating direct delivery of CO₂ to Sporomusa ovata in MES, was utilized as cathode with surface modification of carbon nanotubes (CNTs).

Approach

(A) LSV obtained for the Ni-PHF and Ni-PHF/CNT cathode at a scan rate of 1 mV s⁻¹. (B) Tafel plots derived from LSV data. (C) Nyquist plots of Ni-PHF and Ni-PHF/CNT in blank medium.

SEM images of (A and B) the Ni-PHF cathode and (C and D) the Ni-PHF/CNT cathode after 80 days of S. ovata enrichment.

Conclusion
- A simple but effective method was developed to fabricate porous Ni-PHF cathodes for direct CO₂ delivery to chemolithoautotrophs in MES systems.
- By functionalizing the Ni-PHF's with MWCNTs, the specific surface area, CO₂ adsorption capability and charge transfer of the cathode were significantly enhanced.
- Direct CO₂ delivery and CNT decoration facilitated bacterial adhesion and acetate production rates, as well as electron utilization.

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