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Assisting cultivation of photosynthetic microorganisms by microbial fuel cells to enhance nutrients recovery from wastewater

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2 **fuel cells to enhance nutrients recovery from wastewater**

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12 **Abstract**

13 *Spirulina* was cultivated in cathodic compartments of photo-microbial fuel cells (P-
14 MFC). Anodic compartments were fed with swine-farming wastewater, enriched with
15 sodium acetate (2.4 g_{COD} L⁻¹). Photosynthetic oxygen generation rates were sufficient to
16 sustain cathodic oxygen reduction, significantly improving P-MFC electrochemical
17 performances, as compared to water-cathode control experiments. Power densities (0.8
18 – 1 W m⁻²) approached those of air-cathode MFCs, run as control. COD was efficiently
19 removed and only negligible fractions leaked to the cathodic chamber. *Spirulina* growth
20 rates were comparable to those of control (MFC-free) cultures, while pH was
21 significantly (0.5 - 1 unit) higher in P-MFCs, due to cathodic reactions. Alkaliphilic
22 photosynthetic microorganisms like *Spirulina* might take advantage of these selective
23 conditions. Electro-migration along with diffusion to the cathodic compartment
24 concurred for the recovery of most nutrients. Only P and Mg were retained in the anodic

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