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H. Palma, E. Killoran, M. Sheehan, F. Berner, K. Heimann

PII: S0960-8524(17)30333-4
DOI: http://dx.doi.org/10.1016/j.biortech.2017.03.063
Reference: BITE 17767

To appear in: *Bioresource Technology*

Received Date: 19 December 2016
Revised Date: 6 March 2017
Accepted Date: 8 March 2017

Please cite this article as: Palma, H., Killoran, E., Sheehan, M., Berner, F., Heimann, K., Assessment of microalga biofilms for simultaneous remediation and biofuel generation in mine tailings water, *Bioresource Technology* (2017), doi: http://dx.doi.org/10.1016/j.biortech.2017.03.063

Assessment of microalga biofilms for simultaneous remediation and biofuel generation in mine tailings water

H. Palma[1], E. Killoran[1], M. Sheehan[1*], F. Berner[1], K. Heimann[1]

[1] *College of Science & Engineering, James Cook University, Douglas QLD 4811, Australia*

*Corresponding author at: College of Science & Engineering, James Cook University, Douglas QLD 4811, Australia. Email address: madoc.sheehan@jcu.edu.au Phone number: 61-7-4781 4153

ABSTRACT

Microalgae crops can generate a biochemical profile of high energy density and may be used for remediation of contaminated waste waters. This manuscript presents a laboratory-scale investigation into the potential for growing endemic microalgae biofilms in phosphorus-enriched nickel refinery tailings water, with an emphasis on product potential and the remediation of heavy metals. The dominant species of the consortia was a Chlorella-like microalga. The growth was monitored over time, with a productivity (0.77 ± 0.07 g AFDW.m^{-2}.day^{-1}) showing promising potential. The biochemical profile of biomass had a high total carbohydrate yield (40.0%), and a potential for increased lipid yields (6.7% - 19.5%). Biofilms showed a significant potential for the removal of heavy metals (Ni, Co, Mn, Sr) from the waste water with 24.8%, 10.5%, 24.8% and 26.4% reduction in Ni, Co, Mn and Sr, respectively. Results highlight significant potential for large-scale biofilm biomass production using metal-laden nickel refinery waste waters.