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Concurrent Hydrogen Production and Phosphorus Recovery in Dual Chamber Microbial Electrolysis Cell

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Abstract

Concurrent hydrogen (H_2) production and phosphorus (P) recovery were investigated in dual chamber microbial electrolysis cells (MECs). The aim of the study was to explore and understand the influence of applied voltage and influent COD concentration on concurrent H_2 production and P recovery in MEC. P was efficiently precipitated at the cathode chamber and the precipitated crystals were verified as struvite, using X-ray diffraction and scanning electron microscopy analysis. The maximum P precipitation efficiency achieved by the MEC was 95%, and the maximum H_2 production rate was 0.28 m^3-H_2/m^3-d. Response surface methodology showed that applied voltage had a great influence on H_2 production and P recovery, while influent COD concentration had a significant effect on P recovery only. The overall energy recovery in the MEC was low and ranged from 25 ± 1 to 37 ± 1.7 %. These results confirmed MECs capability for concurrent H_2 production and P recovery.

Keywords: Bio-electrochemical System; Phosphorus Recovery; Microbial Electrolysis Cell; Struvite; Response Surface Methodology

1.0 Introduction

Due to population growth, the global demand for unsustainable resources is rising. As a result, concerns around resource depletion are increasing. Phosphorus is one of the most