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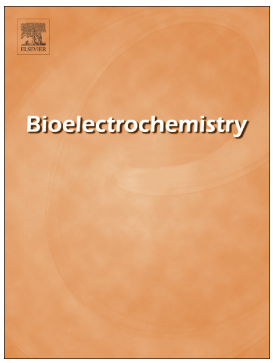

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ACCEPTED MANUSCRIPT

Proteus vulgaris - Pt Electrode System for Urea to Nitrogen Conversion in Synthetic Urine

Myreisa Morales-Cruz[1], Marjorie López-Nieves[1], Roberto Morales-Hernández[1], Gian C. Rivera-Crespo[1], Gary A. Toranzos[2], Ileana González-González[3], and Carlos R. Cabrera[1]

[1] Department of Chemistry, NSF-CREST Center for Innovation, Research and Education in Environmental Nanotechnology (CIRE2N), Molecular Sciences Research Center, University of Puerto Rico, Río Piedras Campus, San Juan, PR 00931

[2] Department of Biology, University of Puerto Rico, Río Piedras Campus, San Juan, PR 00931

[3] Department of Chemistry and Physics, School of Natural Sciences and Technology, Universidad del Turabo, Gurabo, PR 00777

Abstract: One of the most challenging problems when trying to recycle urine for different purposes is the removal of urea. In this project we studied an ureolysis system using the bacterium *Proteus vulgaris* for the transformation of urea to ammonia and its subsequent oxidation to nitrogen at a Pt working electrode. Our system was tested under different pH, microbial reaction times, and urea and bacteria concentrations. Our results indicate that a pH 8 is optimal for the combined *Proteus vulgaris* urease activity and the ammonia oxidation reaction at a Pt electrode. The reaction time and concentration dependence on the ammonia oxidation reaction current densities was also studied. Results showed limited ammonia oxidation under high urea concentrations in ~ 2.5 x 10^9 cfu/mL *Proteus vulgaris* in synthetic urine.

Keywords: ammonia oxidation reaction; Proteus vulgaris; ureolysis; urine; urea

1. Introduction

In 2015, the United Nations reported that more than 40% of the global population is affected by water scarcity and that this number will continue to increase. For this reason, water recovery from wastewater is an essential area ~~problem~~ to study ~~and that must be solved in~~ that could be of help to the modern world [1]. One of the major sources of nutrients in wastewaters is urine [2], (80% nitrogen, 50% phosphorus and 9% potassium) [3]. Hence, human waste treatment could benefit tremendously by separating urine in new toilet systems that produce~~s~~ electricity and clean water. This would bring the added advantages of reducing the amount of water used during flushing cycles, allowing for high nutrient recycling, ~~and would~~ therefore reducing contamination in bodies of water ~~bodies~~ [3, 4]. Apart from urine recycling to obtain water, the removal of urea is important in order to protect the environment. Urea is a key pollutant in agricultural waste due to its stimulation of algal growth, increasing the pH when it is converted to ammonia [5, 6].

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