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Antonio Mineo

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WORK EXPERIENCE

15/06/2019 – 26/07/2019 Budapest, Hungary

VOLUNTEER AS FACILITATOR AIESEC

Antonio Mineo worked as a volunteer for AIESEC during a summer camp in Budapest, Hungary. The carried out activities are related to the Sustainable Development Goal number 4, "Quality Education". As a facilitator, Antonio worked in an international team composed by 8 volunteers. The goal was to educate and raise awareness about the SDGs in children and their families.

Leadership Development Experience Certificate: https://drive.google.com/file/d/1fhpl_0wdpnFRRNgp4tt74lSDWABrY6rO/view?usp=sharing

Business or Sector Education | **Website** https://aiesec.org/

Link https://drive.google.com/file/d/1fhpl_0wdpnFRRNgp4tt74lSDWABrY6rO/view?usp=sharing

02/12/2021 – 02/12/2024 Palermo, Italy

DOTTORANDO UNIVERSITÀ DEGLI STUDI DI PALERMO

Ph.D. student in “Chemical, Environmental, Biomedical, Hydraulic and Materials Engineering” at University of Palermo.
Part of the team of the EU project H2020 chieving wider uptake of water-smart solutions.
Ph.D. thesis: The production of biopolymer from wastewater treatment.

EDUCATION AND TRAINING

08/2019 – 14/10/2021 Palermo, Italy

MASTER DEGREE IN CHEMISTRY Università degli studi di Palermo - Scuola delle Scienze di Base e Applicate

Field of study Chemistry | **Final grade** 110/110 cum laude | **Level in EQF** EQF level 7 |

National classification Master Degree | **Number of credits** 120 |

Thesis Catalytic systems based on carbon nitride and graphene oxide for photodegradation and photoreforming

09/2015 – 03/2019 Palermo, Italy

BACHELOR DEGREE IN CHEMISTRY Università degli studi di Palermo - Scuola delle Scienze di Base e Applicate

Field of study Chemistry | **Final grade** 103/110 | **Level in EQF** EQF level 6 |

Thesis Synthesis of variously substituted diphenylureas as potential biologically active derivatives

LANGUAGE SKILLS

Mother tongue(s): **ITALIAN**

Other language(s):

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken production	Spoken interaction	
ENGLISH	C1	C1	C1	C1	C1

Levels: A1 and A2: Basic user; B1 and B2: Independent user; C1 and C2: Proficient user

DIGITAL SKILLS

Gestione autonoma della posta e-mail | Padronanza del Pacchetto Office (Word Excel PowerPoint ecc) | Google | Windows | Utilizzo del broswer | utilizzo di piattaforme di archiviazione e gestione dati come DropBox Google Drive e WeTransfer | Pianificare e organizzare | Team Working | Capacit di adattamento | Problem Solving

PUBLICATIONS

2023

Polyhydroxyalkanoates production by an advanced food-on-demand strategy: The effect of operational conditions

Despite the increasing number of studies related to the polyhydroxyalkanoate (PHA) production from sewage sludge of wastewater treatment plants, there is still a gap in the correlation between the operational conditions, such as the organic loading rate (OLR), and the intracellular polyhydroxyalkanoate (PHA) content, productivity and final recovery of the polymer. Therefore, this work aims to provide experimental data on PHA productivity and purity in view of scaling up the process to an industrial level taking into account process parameters. In view of that, three OLR were applied during the selection of PHA-accumulating bacteria in sewage sludge. Then, the biomass was harvested and subjected to batch accumulation experiments at two organic loads per dosage by employing a tailor-made software to adopt an automated feed-on-demand strategy, which allowed for 30–56 h of accumulation tests in stand-alone mode. Finally, an improved protocol for PHA extraction has been applied. Experimental results show that the maximum PHA content (60% w/w) was achieved using the highest organic load per dosage during the accumulation test with the biomass selected at the highest OLR (1.8 g COD L^{-1} d^{-1}). Also, the extraction protocol efficiency was proven with four samples with different PHA content, achieving recovery yield as high as 78 ± 3 % with a purity of 89 ± 2 %, thus demonstrating that the adopted strategy might be beneficial for industrial use.

Chemical Engineering Journal, 472, 2023

2023

Effect of organic loading rate on the production of Polyhydroxyalkanoates from sewage sludge

The aim of this work was to study the effect of organic loading rate on the production of Polyhydroxyalkanoates (PHA) from sewage sludge. Synthesis of PHA using sewage sludge as platform was achieved in this work. Three pilot-scale selection-sequencing batch reactors (S-SBR) were used for obtaining a culture able to accumulate PHA following a strategy of aerobic dynamic feeding (ADF) at different volumetric organic-loading-rate (vOLR): 1.3, 1.8 and 0.8 g COD L^{-1} d^{-1} for S-SBR 1, S-SBR 2 and S-SBR 3, respectively. Decreasing the vOLR enhanced the general performance of the process as for organic matter removal (from 99.2% ± 0.3% in S-SBR-3 to 92 ± 2 in S-SBR-2) while the opposite trend was recorded for PHA production (6.0 PHA % w/w in S-SBR-3 vs 13.7 PHA % w/w in S-SBR-2 at the end of the feast phase). Furthermore, indirect and direct emissions, as N2O, were evaluated during the process for the first time. Finally, three accumulation tests were performed achieving 24% w/w.

Journal of Environmental Management, 343, 2023

2023

Sewage sludge acidogenic fermentation for organic resource recovery towards carbon neutrality: an experimental survey testing the headspace influence

Volatile fatty acids (VFAs) produced by acidogenic digestion of sewage sludge are very interesting bio-products which can contribute to carbon neutrality of wastewater treatment plants. Studies on the production of VFAs from sewage sludge from fermenters with membrane are limited. In view of above,

VFAs from a fermenter pilot plant equipped with a membrane bioreactor and fed with real sewage sludge has been monitored. The effect of headspace volume (HdV) on VFA production was studied for the first time to elucidate the optimal operation conditions. Specifically, three fermenter HdV values (namely, 20, 40 and 60% of the total volume) have been investigated. Results revealed that the HdV of 20% ensured the highest sCOD production (900 mgCOD/L) and VFA/COD ratio (45.4%). High value of HdV (namely, 40 and 60%) strongly decreased the acidogenic fermentation performance in terms of VFA production.

Bioresource Technology, 367, 2023

2022

Initial pH Conditions Shape the Microbial Community Structure of Sewage Sludge in Batch Fermentations for the Improvement of Volatile Fatty Acid Production

Conversion of wastewater treatment plants into biorefineries is a sustainable alternative for obtaining valuable compounds, thus reducing pollutants and costs and protecting the environment and human health. Under specific operating conditions, microbial fermentative products of sewage sludge are volatile fatty acids (VFA) that can be precursors of polyhydroxyalkanoate thermoplastic polyesters. The role of various operating parameters in VFA production has yet to be elucidated. This study aimed to correlate the levels of VFA yields with prokaryotic microbiota structures of sewage sludge in two sets of batch fermentations with an initial pH of 8 and 10. The sewage sludge used to inoculate the batch fermentations was collected from a Sicilian WWTP located in Marineo (Italy) as a case study. Gas chromatography analysis revealed that initial pH 10 stimulated chemical oxygen demands (sCOD) and VFA yields (2020 mg COD/L) in comparison with initial pH 8. Characterization of the sewage sludge prokaryotic community structures—analyzed by next-generation sequencing of 16S rRNA gene amplicons—demonstrated that the improved yield of VFA paralleled the increased abundance of fermenting bacteria belonging to Proteobacteria, Bacteroidetes, Chloroflexi, and Firmicutes phyla and, conversely, the reduced abundance of VFA-degrading strains, such as archaeal methanogens.

Microorganisms 2022, 10(10), 2073

2023

Enhancing the production of volatile fatty acids by potassium permanganate from wasted sewage sludge: A batch test experiment

Recovering resources from wastewater treatment is vital for the transition from a linear to a circular economy model in the water sector. Volatile Fatty Acids (VFAs) are valuable products among the possible recovered resources. This study investigates the influence of potassium permanganate ($KMnO_4$) addition during acidogenic fermentation of waste activated sludge for enhancing VFAs production. Specifically, different fermentation batch tests with and without $KMnO_4$ addition were carried out using two distinctive sewage sludges as feedstocks. Results showed that $KMnO_4$ addition increased the VFAs yield up to 144 and 196 mgCOD/g VSS for the two sludges. When $KMnO_4$ was used as pre-treatment, 55 % of sCOD were VFAs. This latter result was mainly debited to the recalcitrant organics' disruption promoted by the oxidative permanganate ability.

Heliyon 2023, 9 (11), E21957

2023

Polyhydroxyalkanoate production from fermentation of domestic sewage sludge monitoring greenhouse gas emissions: A pilot plant case study at the WRRF of Palermo University (Italy)

This paper presents a comprehensive study on polyhydroxyalkanoate (PHA) production from sewage sludge. Greenhouse gas (GHG) emissions were monitored for the first time to assess the impact of climate change and environmental sustainability. The pilot plant was composed of a fermenter with a membrane and two biological reactors (namely, selection and accumulation). Results showed that despite a low organic loading rate (namely, 0.06 kg BOD kg SS^{-1} day^{-1}), a good PHA yield was obtained (namely, 0.37 g PHA/g volatile fatty acids), confirming that sewage sludge can be a suitable feedstock. GHG emissions were 3.85E-04 g CO_2eq/g and 32.40 g CO_2eq/g, direct and indirect, respectively. Results provided valuable insights in view of finding a trade-off between PHA production and GHG emissions to prove the PHA production process as an effective solution for biosolids disposal at a low carbon footprint.

Journal of Environmental Management 2023, 348, 119423

2024

Reduction of sewage sludge and N2O emissions by an Oxic Settling Anaerobic (OSA) process: The case study of Corleone (Italy) wastewater treatment plant

Biosolid management is becoming one of the most crucial issues for wastewater treatment plant (WWTP) operators. The application of the Oxic Settling Anaerobic (OSA) process allows the minimisation of excess sludge production. This study compares conventional activated sludge (CAS) and OSA layouts in a full-scale WWTP (namely, Corleone - Italy). Extensive monitoring campaigns were conducted to assess treatment performances regarding carbon and nutrient removal, greenhouse gas (GHG) emissions, excess sludge production, and biomass activity (by means of respirometric analysis). Results showed that the effluent quality consistently met the Italian discharge limits. However, with the implementation of the OSA process, there was a decrease in ammonium removal efficiency, which could be attributed to reduced nitrifier activity related to reduced biomass production and extended anaerobic conditions affecting the nitrification process. On the other hand, the OSA configuration significantly increased phosphorus removal, indicating a high phosphorus content in the resulting waste sludge. A worsening of the sludge settling properties was observed with the OSA configuration likely due to decreased EPS concentrations. The sludge production in the OSA configuration decreased by 17.3 % compared to CAS. Nitrous-oxide measurements did not show a variation between CAS and OSA configurations, confirming that the OSA process can be a suitable solution for reducing WWTP's carbon footprint.

Science of The Total Environment 2024, 906, 167793

2024

Enhancing volatile fatty acid production from sewage sludge in batch fermentation tests

Volatile fatty acids (VFA) from sewage sludge represent an excellent recovered resource from wastewater treatment. This study investigated four sludge pre-treatments (namely, potassium permanganate - $KMnO_4$, initial pH = 10, initial pH = 2.5 and low-temperature thermal hydrolysis) by operating batch reactors under acidogenic fermentation conditions. Results revealed that 0.1 g $KMnO_4$/g of total suspended solids represents the best pre-treatment obtaining up to 2713 mgCOD L^{-1} and 452 mgCOD/g of volatile suspended solids. These results also paralleled metataxonomic analysis highlighting changes in prokaryotic microbial structures of sewage sludge of the batch fermentations subjected to the different pre-treatments.

Chemosphere 2024, 349, 140859

2024

Volatile fatty acids from sewage sludge by anaerobic membrane bioreactors: Lesson learned from two-year experiments with fouling analysis by the resistance in series model

Volatile fatty acid (VFA) production from sewage sludge has become one of the main biotechnologies implemented in view of the circular economy application in wastewater treatment plant (WWTP) management. In this study, domestic sewage sludge collected from three WWTPs over two-year experiments was subjected to acidogenic fermentation. The fermented liquid was recovered through an ultrafiltration membrane. The membrane fouling was analysed in detail by applying the resistance in series model, revealing the major role of the extra polymeric substances in the reversible fouling, accounting for 91.2 % of the total resistance. Finally, the major contribution of the carbon footprint assessment was due to the indirect emissions (1.30 kg CO2eq/m3). The study has the novelty of providing an in-depth understanding of MBR membrane fouling used for solid/liquid separation in a plant aimed at VFA recovery from sewage sludge acidogenic fermentation. Also, the carbon footprint assessment provides insights regarding the environmental impact of VFA recovery through ultrafiltration membrane.

Results in Engineering 2024, 21, 101839

2024

The effect of aeration mode (intermittent vs. continuous) on nutrient removal and greenhouse gas emissions in the wastewater treatment plant of Corleone (Italy)

The paper reports the results of an experimental study aimed at comparing two configurations of a full-scale wastewater treatment plant (WWTP): conventional activated sludge (CAS) and oxic-settling-anaerobic process (OSA) with intermittent aeration (IA). A comprehensive monitoring campaign was carried out to assess multiple parameters for comparing the two configurations: carbon and nutrient removal, greenhouse gas emissions, respirometric analysis, and sludge production. A holistic approach has been adopted in the study with the novelty of including the carbon footprint (CF) contribution (as direct, indirect and derivative emissions) in comparing the two configurations. Results showed that the OSA-IA configuration performed better in total chemical oxygen demand (TCOD) and ortho-phosphate (PO_4-P) removal. CAS performed better for Total Suspended Solids (TSS) removal showing a worsening of settling properties for OSA-IA. The heterotrophic yield coefficient and maximum growth rate decreased, suggesting a shift to sludge reduction metabolism in the OSA-IA configuration. Autotrophic biomass showed a reduced yield coefficient and maximum growth yield due to the negative effects of the sludge holding tank in the

OSA-IA configuration on nitrification. The OSA-IA configuration had higher indirect emissions (30.5 % vs 21.3 % in CAS) from additional energy consumption due to additional mixers and sludge recirculation pumps. The CF value was lower for OSA-IA than for CAS configuration (0.36 $kgCO_2/m^3$ vs 0.39 $kgCO_2/m^3$ in CAS).

Science of The Total Environment 2024, 924, 171420