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Alessandro Milani

Nationality: Italian (+39) 3496287304 **Date of birth:** 20/05/1996 **Gender:** Male

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ABOUT ME

I won a scholarship for a PhD in chemical processes for industry and the environment at the La Sapienza University of Rome. I am interested in issues concerning environmental protection and energy production through biotechnological systems.

WORK EXPERIENCE

PhD student

Sapienza University [01/01/2022 – Current]

City: Rome

Country: Italy

- Study of scientific articles for the development of protocols relating to the research activity.
- Definition of operating procedures aimed at achieving the assigned objectives.
- Performing activities outside of one's role to support colleagues and structure.

Curricular internship

Water research institute (IRSA) - National Research Council (CNR) [02/11/2020 – 18/10/2021]

City: Rome

Country: Italy

Execution of experimental tests in the laboratory aimed at the study and development of bioelectrochemical processes for the treatment of contaminated environmental matrices

EDUCATION AND TRAINING

Master degree in industrial and environmental biotechnology

Sapienza University [18/10/2021]

Address: P.le A.Moro 5, 00185 Rome (Italy)

Field(s) of study: Natural sciences, mathematics and statistics

Final grade : 110/110 Cum laude

Thesis: Bioremediation of toluene contaminated groundwater through the "bioelectrochemical well"

Use of chromatographic techniques (GC and GC-MS)
Solid-liquid separation techniques
Bioelectrochemical systems and associated analysis techniques (chronoamperometry, cyclic voltammetry and EIS)
Microcosm studies

Bachelor degree in agro-industrial biotechnology

Sapienza University [09/05/2019]

Address: P.le A.Moro 5, 00185 Rome (Italy)

Field(s) of study: Natural sciences, mathematics and statistics
Thesis: Isolation and characterization of environmental yeast for the production of fermented beverage

Work in sterile conditions
Use of instruments for microbiology (laminar flow hood, autoclave, Petri dishes, micropipettes etc.)
Isolation of yeasts from environmental matrices
Creation of culture media

PUBLICATIONS

Syntrophy drives the microbial electrochemical oxidation of toluene in a continuous-flow "bioelectric well"

[2022]
https://doi.org/10.1016/j.jece.2022.107799

Journal of Environmental Chemical Engineering Volume 10, Issue 3, June 2022, 107799

Microbial electrochemical technologies (MET) are promising for the remediation of groundwater pollutants such as petroleum hydrocarbons (PH). Indeed, MET can provide virtually inexhaustible electron donors or acceptors directly in the subsurface environment. However, the degradation mechanisms linking contaminants removal to electric current flow are still largely unknown, hindering the development of robust design criteria.

Here, we analysed the degradation of toluene, a model PH, in a bioelectrochemical reactor known as "bioelectric well" operated in continuous-flow mode at various influent toluene concentrations. With increasing concentration of toluene, the removal rate increased while the current tended to a plateau, hence the columbic efficiency decreased. Operation at open circuit confirmed that the bioelectrochemical degradation of toluene proceeded via a syntrophic pathway involving cooperation between different microbial populations. First of all, hydrocarbon degraders quickly converted toluene into metabolic intermediates probably by breaking the aromatic ring upon fumarate addition. Subsequently, fermentative bacteria converted these intermediates into volatile fatty acids (VFA) and likely also H2, which were then used as substrates by electroactive microorganisms forming the anodic biofilm. As toluene degradation is faster than subsequent conversion steps, the increase in intermediate concentration could not result in a current increase.

This work provides valuable insights on the syntrophic degradation of BTEX, which are essential for the application of microbial electrochemical system to groundwater remediation of petroleum hydrocarbons.

A Microcosm Treatability Study for Evaluating Wood Mulch-Based Amendments as Electron Donors for Trichloroethene (TCE) Reductive Dechlorination

[2021]
https://doi.org/10.3390/w13141949

Water 2021, 13(14), 1949

In this study, wood mulch-based amendments were tested in a bench-scale microcosm experiment in order to assess the treatability of saturated soils and groundwater from an industrial site contaminated by chlorinated ethenes. Wood mulch was tested alone as the only electron donor in order to assess its potential for stimulating the biological reductive dechlorination. It was also tested in combination with millimetric iron filings in order to assess the ability of the additive to accelerate/improve the bioremediation process. The efficacy of the selected amendments was compared with that of unamended control microcosms. The results demonstrated that wood mulch is an effective natural and low-cost electron donor to stimulate the complete reductive dechlorination of chlorinated solvents to ethene. Being a side-product of the wood industry, mulch can be used in environmental remediation, an approach which perfectly fits the principles of circular economy and addresses the compelling needs of a sustainable and low environmental impact remediation. The efficacy of mulch was further improved by the co-presence of iron filings, which accelerated the conversion of vinyl chloride into the ethene by increasing the H2 availability rather than by catalyzing the direct abiotic dechlorination of contaminants. Chemical analyses were corroborated by biomolecular assays, which confirmed the stimulatory effect of the selected amendments on the abundance of *Dehalococcoides mccartyi* and related reductive dehalogenase genes. Overall, this paper further highlights the application potential and environmental sustainability of wood mulch-based amendments as low-cost electron donors for the biological treatment of chlorinated ethenes.

LANGUAGE SKILLS

Mother tongue(s): **Italian**

Other language(s):

English

LISTENING B2 **READING** B2 **WRITING** B2

SPOKEN PRODUCTION B2 **SPOKEN INTERACTION** B2

DIGITAL SKILLS

My Digital Skills

Microsoft Office / Microsoft Word / Microsoft Excel / Microsoft Powerpoint / Conoscenza di software per videochiamate (Teams, Skype, Zoom, Google Meet) / Ottima conoscenza dei servizi di comunicazione (social, messaggistica, posta elettronica)