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Keynote Speaker

Prof. Mauro Majone

FUNDAMENTALS AND ADVANCES ON BIOELECTROCHEMICAL DECHLORINATION

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In last two decades, starting from the fascinating ability of several microbes to engage with solid phases to exchange electrons for their metabolisms, the research community showed a tremendous increase of interest in investigating and developing bioelectrochemical systems for a wide range of applications. Applications include low-voltage electricity generation from waste streams (microbial fuel cell), methane or hydrogen production (microbial electrolysis cells), production of added value building blocks (microbial electrosynthesis), and external control of redox condition for triggering preferred metabolic pathways (electrofermentation). Last but not least, bioelectrochemical systems have been investigated in the field of bioremediation of contaminated matrixes, especially sediments and groundwater for a range of reducible or oxidable contaminants, such as hydrocarbons, arsenic, chromiun, nitrate, sulphate and halogenated compounds.
As for the latter, given that a bioelectrochemical system can create both reductive and oxidative environments in close proximity each other (but also fully separated), this approach can be particularly effective for highly chlorinated compounds (such as perchloroethylene, trichloroethylene and tetrachloroethane) where full reductive dechlorination is sometimes hindered or too slow. Moreover, given that the electrodic material, used to supply or catch electrons, can also offer the physical support for attached microbial growth, bioelectrochemical systems are a unique tool for activating microbial reactions in a well-defined and controlled space. Fine tuning of electrochemical conditions, such as applied voltage, gives the system a high flexibility, which can be used to trigger wanted reactions against competing ones (e.g. methane formation or sulfate reduction).
After a brief introduction on fundamentals of bioelectrochemical systems, this lecture will focus on their development for remediation of groundwater contaminated by aliphatic chlorinated compounds in last 15 years, moving from the proof of principles to most recent advances for filed application. The importance of combining process engineering aspects with microbiology and molecular biology will be highlighted

Biography

Professor of Chemical Engineering at the Department of Chemistry of the University of Rome “La Sapienza”.
- Head of the multidisciplinary Research Center for protection of Environment and Cultural Heritage (CIABC).
- Research areas: environmental and Industrial biotechnologies for treatment and valorisation of waste and wastewater. Biopolymer (PHA) production. Remediation of polluted soils and groundwater.
- Co-author of more than 200 papers on international scientific journals with peer review, which received more than 7300 citations (Scopus, HI=49).
- Scientific coordinator of several research projects under public or private commitment, including principal investigator of Sapienza research units in several FP7 and H2020 Projects.
- Coordinator of the H2020 Project RES URBIS (GA 730349) “Resources from Urban BioWaste”.