

Bio-Electro Chemical Catalysis: Redox Interactions, Storm and Waste Water Treatment

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Abstract : Context: This scientific innovation demonstrate organic catalysis engineered media effective desalination of surface and groundwater. The author has developed a technology called "Storm-Water Ions Filtration Treatment" (SWIFTTM) cold reactor modules designed to retrofit typical urban street storm drains or catch basins. SWIFT triggers biochemical redox reactions with water stream-embedded toxic total dissolved solids (TDS) and electrical conductivity (EC). SWIFTTM Catalysts media unlock the sub-molecular bond energy, break down toxic chemical bonds, and neutralize toxic molecules, bacteria and pathogens. Research Aim: This research aims to develop and design lower O&M cost, zero-brine discharge, energy input-free, chemical-free water desalination and disinfection systems. The objective is to provide an effective resilient and sustainable solution to urban storm-water and groundwater decontamination and disinfection. Methodology: We focused on the development of organic, non-chemical, no-plugs, no pumping, non-polymer and non-allergenic approaches for water and waste water desalination and disinfection. SWIFT modules operate by directing the water stream to flow freely through the electrically charged media cold reactor, generating weak interactions with a water-dissolved electrically conductive molecule, resulting in the neutralization of toxic molecules. The system is powered by harvesting sub-molecular bonds embedded in energy. Findings: The SWIFTTM Technology case studies at CSU-CI and CSU-Fresno Water Institute, demonstrated consistently high reduction of all 40 detected waste-water pollutants including pathogens to levels below a state of California Department of Water Resources "Drinking Water Maximum Contaminants Levels". The technology has proved effective in reducing pollutants such as arsenic, beryllium, mercury, selenium, glyphosate, benzene, and E. coli bacteria. The technology has also been successfully applied to the decontamination of dissolved chemicals, water pathogens, organic compounds and radiological agents. Theoretical Importance: SWIFT technology development, design, engineering, and manufacturing, offer cutting-edge advancement in achieving clean-energy source bio-catalysis media solution, an energy input free water and waste water desalination and disinfection. A significant contribution to institutions and municipalities achieving sustainable, lower cost, zero-brine and zero CO₂ discharges clean energy water desalination. Data Collection and Analysis Procedures: The researchers collected data on the performance of the SWIFTTM technology in reducing the levels of various pollutants in water. The data was analyzed by comparing the reduction achieved by the SWIFTTM technology to the Drinking Water Maximum Contaminants Levels set by the state of California. The researchers also conducted live oral presentations to showcase the applications of SWIFTTM technology in storm water capture and decontamination as well as providing clean drinking water during emergencies. Conclusion: The SWIFTTM Technology has demonstrated its capability to effectively reduce pollutants in water and waste water to levels below regulatory standards. The Technology offers a sustainable solution to groundwater and storm-water treatments. Further development and implementation of the SWIFTTM Technology have the potential to treat storm water to be reused as a new source of drinking water and an ambient source of clean and healthy local water for recharge of ground water.

Keywords : catalysis, bio electro interactions, water desalination, weak-interactions

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