World Academy of Science, Engineering and Technology
International Journal of Environmental and Ecological Engineering
Vol:11, No:04, 2017

Biofouling Control during the Wastewater Treatment in Self-Support Carbon Nanotubes Membrane: Role of Low Voltage Electric Potential

Authors : Chidambaram Thamaraiselvan, Carlos Dosoretz

Abstract : This work will explore the influence of low voltage electric field, both alternating (AC) and direct (DC) currents, on biofouling control to highly electrically conductive self-supporting carbon nanotubes (CNT) membranes at conditions which encourage bacterial growth. A mutant strain of Pseudomonas putida S12 was used a model bacterium. The antibiofouling studies were performed with flow-through mode connecting an electric circuit in resistive mode. Major emphasis was placed on AC due to its ability of repulsing and inactivating bacteria. The observations indicate that an AC potential >1500 mV, 1 kHz frequency, 100 Ω external resistance on ground side and pulse wave above the offset (+0.45) almost completely prevented attachment of bacteria (>98.5%) and bacterial inactivation (95.3±2.5%). Findings suggest that at the conditions applied, direct electron transfer might be dominant in a decrease of cell viability. AC resulted more effective than DC, both in terms of biofouling reduction compared to cathodic DC and in terms of cell inactivation compared to anodic DC. This electrically polarized CNT membranes offer a viable antibiofouling strategy to hinder biofouling and simplify membrane care during filtration.

Keywords : bacterial attachment, biofouling control, low electric potential, water treatment
Conference Title : ICEWRM 2017 : International Conference on Environment and Water Resource Management
Conference Location : Paris, France
Conference Dates : April 18-19, 2017