Microbial Desalination Cells (MDCs) for Sea Water Desalination, Simultaneous Wastewater Treatment, and Electricity Production

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The emerging global water crisis is significant. Urban congestion is mushrooming at an alarming rate and has increased by 41 percent since the early 1990s. Consequently, with agriculture being the biggest employer of youth around the globe, water scarcity could increase unemployment levels. As a result, searching for unconventional water resources is indispensable. With this in mind, microbial desalination cells constitute an innovative technology: where microbial fuel cells and electrodialysis merge in the same device for obtaining applicable water for agriculture, with no energy associated costs, simultaneous wastewater treatment, and electricity production. The main difference between the MDCs and other desalination processes, such as RO and electrolysis, is their independence from an external energy input for their operation. Microbial desalination cells work by harnessing the power of the oxidation reactions' products; held by the lactobacillus acidophilus bacteria for organic matter degradation. Microbial desalination cells showed efficient results in lowering the TDS value of the desalinated seawater from 40,000mg/l to 600mg/l, which is the applicable water used for agriculture for all crop types. Contrastly, the prior used ion exchange membranes in the conventional MDCs suffered from high cost; and lack of availability. In addition to the requirement for energy input for their operation. Consequently, the polystyrene material used in the ion exchange membranes construction was replaced by the PVC cement material as a modification, changing it into a porous membrane.

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