A Quantum Leap: Application of CNTs/GOs/GQDs to Desalination Using MDCs

Khazi-Syed, Ashar (School: Harmony School of Innovation - Fort Worth)

Water covers about 71% of the earth's surface, yet water shortages are impending worldwide. While this can be baffling, it's simple: out of the 71% of water only 3% is fresh water and 1% is readily available. Now imagine that we could use the next most abundant resource on the planet to purify water to a drinkable state. Soil has two bacteria, Shewanella and Geobacter which produce electricity that has several applications. Microbial Desalination Cells is one such application which works by creating a voltage potential which pulls the salt bonds apart and then filtered using ion exchange membranes. The goal of my research this year is to improve the efficiency of the MDC, so in this experiment I used a novel method to enhance the anode with carbon nanotubes (CNT), Graphene Oxide (GO), Graphene Quantum Dots (GQD). In the past CNTs were studied, but their cost-effectiveness and environmental impacts were also acknowledged. As a result, in this study cheaper and more environmentally friendly conductive materials were studied. It was shown that that the CNTs had the greatest impact, but GO and GQD were not too far behind with similar positive impacts of the desalination cells. But when looking at it from a cost perspective we see that the GQDs did the best. Unfortunately, water shortages have become a familiar issue worldwide. From the richest countries like the USA to the poorest like Madagascar, all face water shortages at some level with little evidence of improvement. While some scientists expect shortages to increase, this work is evidence that economically viable green solutions are not too far away.