Development of Self-Managed Seawater Desalination Device with Biofouling Reduction Powered by the Tidal Range

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We present a sustainable self-managed seawater desalination device model that can desalinate seawater and reduce biofouling on semipermeable membrane using energy from the Sun and the tidal range. This device was designed and constructed to move up and down as the water level rise and fall due to buoyancy from the water. Simultaneously, membranes coated with titanium dioxide (TiO2) reduce biofouling through solar irradiation by the light transmitted through the transmitting structure. We measured the intensity of the light that could get through the transmitting structure and found out that the device was efficient in reducing micro algae. Moreover, we confirmed the device's desalination and biofouling removal performance through experiment with micro algae : a subject of biofouling. The capability of the device was verified as we observed considerable reduction of micro algae through the microscope after contaminating the membrane with micro algae and exposing the device in direct sunlight. Due to the water stress, many coastal countries exploit seawater through desalination. This project suggests that the process of water resource manufacturing utilizes energy solely from the environment. We anticipate the research to inspire numerous coastal regions that are suffering from lack of water and energy.