Aerosol Driven Purification: A Novel Method for Purifying Water Utilizing Phase Changes

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Industrial Reverse Osmosis (“RO”) provides safe drinking water to homes and is supplied by ocean water. As such, the quantity of waste water produced by this method is inconsequential. Notably, RO treatment plants typically convey only 25% of their supply into potable water. For inland communities with limited access, wasting 75% of their supply water is unsustainable. This project explores a method of water filtration, designing a unique process for efficiently creating drinkable water from non potable supplies. When water is turned into an aerosol, water molecules will vaporize and contaminants will separate from said molecules. In a closed environment, water vapor can pass through a filter, condense and collect as purified water. The testing apparatus houses the water purification system. Data was collected on the reduction in TDS of system processed water, total kWh consumed by the system and total recovery rate in volume of water.On average across all tests, 0.617 kWh was used to produce 1 liter of processed water.The average net supply of contaminated water was 977 mL. Of which, an average of 910 mL was recovered resulting in an average recovery rate of 93.2%. On average the TDS was reduced by 71.8%, exceeding most US standards. In conclusion, the hypothesis was proven correct. By creating an aerosol derived from non-potable water the system was able to effectively separate contaminants from water molecules and produce clean water. Quality drinking water is becoming increasingly scarce and simple, cost-effective methods of purifying water are needed world wide. Because of the simplistic nature of the design, if proven to be sufficiently energy efficient, this process can scale from individual units to commercial scale using the same design and operating theory.