Addressing Global Water Scarcity: Novel Dewatering Techniques for Hydrophilic Saponified Starch-Grafted-Polyacrylamide Hydrogel Based Desalination Using UV Light, Ca(OH)2, and Dry Ice to Improve Reusability of Super-Absorbent Polymers

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With over a billion people affected by lack of access to freshwater, desalination is an important avenue to ameliorate this crisis. Prior research by the author demonstrated the feasibility of using super-absorbent polymers(SAP) to desalinate water without external thermal or electrical energy. The water recovery technique demonstrated in that research adversely affected the polymer's hydrophilic linkages upon dewatering. Preventing degradation of the polymer is critical to improve the cost effectiveness and yield of the process. The current study investigates the possibility of dewatering hydrogels while preserving the reabsorption capacity of the underlying SAP. The present study harvested fresh water from the hydrogel using two distinct means – Ultraviolet(UV) light, and treatment using Ca(OH)2 and dry ice. This required a) controlled exposure of hydrogels to UV light to create liquid water, and b) an sequential treatment of the hydrogel with Ca(OH)2 and dry ice to produce liquid water. Preliminary tests on the water recovered from UV treatment confirmed their propensity to flow in existing irrigation systems, ability to grow plants, and reusability of SAP. Preliminary tests on water recovered from Ca(OH)2 and dry ice treatment confirmed the reusability of SAP. Both the proposed techniques demonstrated significant recovery of the SAP used. Such reusability reduces the variable costs of desalination. Mass dissemination and deployment of desalination capabilities require that the technology be sustainable and accessible for low volumes of production. The augmentation and optimization of hydrogel based desalination with the proposed dewatering techniques may be able to further the cause of such broad access to cost effective and easily deployable desalination units.

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