Desalination by Pervaporation System

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Fierce national competition over water resources has prompted fears that water issues contain the seeds of violent conflict. In contrast, water scarcity is one of the biggest grand challenges that face the world especially Egypt as standard human usage of water is 3000 L/year while Egypt provides less than 500 L/year. The ability to desalinate seawater became a priority. As a result, our purpose is constructing a system of water desalination that can afford high salinity water more than 90,000 ppm with low cost, energy consumption compared to other systems, available material dependence in Egypt, good mechanical and thermal stability for the membrane and ecofriendly. Therefore, pervaporation technology was chosen to deal with this significant problem by heating feed water to 80oC using a membrane cell exposed to vacuum resulting in vapor permeate that is condensed to form fresh water. Prototype was constructed for addressing the effect of initial salt solution concentration (Ci) and pervaporation temperature (Tpv) on the water flux (J), salt rejection (%SR). The membrane was prepared by phase-inversion technique from cellulose acetate and graphene oxide, before which the membrane was subjected to pretreatment. The results confirmed J varied from (6) to (9) l/m^2h with high salt rejection 98 % at Tpv (80oC). For the sake of saving energy the system was integrated to raise only 20oC instead of 55oC. Pervaporation can be used in multitude of different applications as treatment of formation water. Subsequently, this system can be applied in poor countries accessing fresh water to citizens.

Awards Won:
Fourth Award of $500
Sigma Xi, The Scientific Research Honor Society: First Award of $3,000
U.S. Agency for International Development: Fourth Award of $500