Design of the Brine Evaporation Bag for Increased Water Recovery in Microgravity.

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The existing water recovery system on the International Space Station (ISS) is limited to 75% reclamation; consequently, long duration space missions are currently unfeasible due to the large quantity of water necessary to sustain the crew. The Brine Evaporation Bag (BEB) is a proposed system to supplement the existing water recovery system aboard the ISS that can to increase water recovery to 99%.

The largest barrier to high water recovery is mineral scaling inside the water recovery equipment, which leads to equipment failure; therefore, some water must remain to keep the minerals dissolved. This waste stream is liquid brine containing salts, acids, organics, and water. The BEB is designed to recover this remaining water while protecting the equipment from scale.

The BEB consists of a sealed bag containing a hydrophobic membrane that allows water vapor and gas to pass through. It is operated under vacuum, heated, and continuously filled with brine to boil away the water. The water vapor is recovered and the solids are contained inside the bag for disposal. The BEB can dry the brine to a solid block. Ongoing work includes improving the design of the BEB and the evaporator to prevent leaks, maximize the rate of water removal, and minimize energy use and weight. Additional testing will determine whether designs are heat- or mass-transfer limited and the optimal water recovery rate.

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