

An Approach for Hydrogen Recycling in a Closed-Loop Life Support Architecture to Increase Oxygen Recovery Beyond State-of-the-Art

State-of-the-art atmosphere revitalization life support technology on the International Space Station is theoretically capable of recovering 50% of the oxygen from metabolic carbon dioxide via the Carbon Dioxide Reduction Assembly (CRA). When coupled with a Plasma Pyrolysis Assembly (PPA), oxygen recovery increases dramatically, thus drastically reducing the logistical challenges associated with oxygen resupply. The PPA decomposes methane to predominantly form hydrogen and acetylene. Because of the unstable nature of acetylene, a down-stream separation system is required to remove acetylene from the hydrogen stream before it is recycled to the CRA. A new closed-loop architecture that includes a PPA and downstream Hydrogen Purification Assembly (HyPA) is proposed and discussed. Additionally, initial results of separation material testing are reported.