Paper ID: 31597
oral

66th International Astronautical Congress 2015

HUMAN SPACEFLIGHT SYMPOSIUM (B3)
Advanced Systems, Technologies, and Innovations for Human Spaceflight (7)

Author: Dr. Masato Sakurai
Japan Aerospace Exploration Agency (JAXA), Japan, sakurai.masato@jaxa.jp

STUDY OF AIR RE-VITALIZATION FOR A FUTURE LONG DURATION MANNED SPACE MISSION

Abstract

To support long-duration manned space missions beyond Earth orbit, recycling life support systems will be necessary to reduce the mass of consumables required. Such systems will also have to be lightweight, compact and have low power consumption. The Japan Aerospace Exploration Agency (JAXA) is therefore developing ECLSS for future manned space missions such as water purification, CO2 reduction and oxygen generation. JAXA is currently studying an air revitalization system for an on-orbit demonstration on the International Space Station (ISS) early in the extended ISS operation period (2015–2020) to support proposed post-ISS missions such as manned Moon, Mars or asteroid exploration. Regenerative functions include oxygen recovery from carbon dioxide using a combination of CO2 reduction by the Sabatier process and O2 generation by electrolysis. Water electrolysis is a key technology because the hydrogen it produces is used for CO2 reduction and the oxygen is essential for human respiration. A simple method for obtaining dry oxygen from electrolysis is also important. This paper presents the air re-vitalization system for the demonstrator and gives water electrolysis in microgravity. In this paper, we investigate SPE (solid polymer electrolyte) water electrolysis and discuss the 'Cathode Feed' operation of an electrolyzer. Although water is usually supplied to the anode side of ground-based electrolysis cells (anode feed), we adopt cathode feed to obtain dry oxygen. The performance of the cathode feed cell can achieve its design target by flushing the gas bubbles that adhere to the electrodes.