Paper ID: 60460
student

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

Author: Mr. Samuel Anih
University of Cape Town, South Africa

Mr. Adam S. Pagan
IRS, University of Stuttgart, Germany
Mr. Helmut Koch
IRS, University of Stuttgart, Germany
Prof. Peter Martinez
South Africa
Prof. Rene Laufer
Luleå Technical University, Sweden
Prof.Dr. Georg Herdrich
Institute of Space Systems, Germany

INVESTIGATIONS OF LONG-DURATION CREWED SPACE MISSIONS SOLID WASTE MANAGEMENT USING WASTE FOR ENERGY AND VOLUME RECOVERY (WEVR) EXPERIMENTS

Abstract

Astronauts embarking on long-duration crewed space missions to destinations further away from the Earth in the future will have to contend with challenges of proper waste management due to several constraints, such as limited resources, absence of constant resupply of consumables, limited habitable volume inside the spacecraft, isolation from the Earth system and limited waste stowage space for a longer period of the mission. The use of the high enthalpy inductively heated plasma generators IPG3 and IPG4 for decomposition of crewed space missions waste simulants was investigated during the Waste for Energy and Volume Recovery (WEVR) campaign conducted at the at the Institute of Space Systems (IRS) of the University of Stuttgart, a partner institution of the University of Cape Town's SpaceLab. Reference waste package simulants were subjected to series of decomposition processes using the two IRS inductively heated plasma generators in Plasma Wind Tunnel 3 (PWK3). The investigations were designed to assess and characterize the responses of the various samples to thermal decomposition in the given plasma flow using oxygen and nitrogen operational gases under a thermal steady state condition leading to attendant products which were analyzed. This paper details simulant decomposition scheme during WEVR campaign in addition to results from physical and spectroscopic analysis with possible application to long duration crewed spaceflight.