Paper ID: 9485
oral

SPACE LIFE SCIENCES SYMPOSIUM (A1)
Life Support and EVA Systems (6)

Author: Dr. Leonid Bobe
NIICHIMMASH, Russian Federation

Mr. Sergey Romanov
S.P. Korolev Rocket and Space Corporation Energia, Russian Federation
Dr. Lev Gavrilov
NIICHIMMASH, Russian Federation
Mr. Alexey Kochetkov
NIICHIMMASH, Russian Federation
Mr. Edvard Kurmazenko
NIICHIMMASH, Russian Federation
Mr. Peter Andreychuk
S.P. Korolev Rocket and Space Corporation Energia, Russian Federation
Mr. Alexandr Zeleznyakov
RSC Energia, Russian Federation
Dr. Yury Sinjak
Institute for Biomedical Problems, Russian Federation

REGENERATIVE LIFE SUPPORT SYSTEMS UTILIZED DURING AN INITIAL STAGE OF MANNED LUNAR BASE CONSTRUCTION

Abstract

Manned lunar base support shall rely on the greatest possible closed – loop cycle of water consumption and recovery as well as air revitalization (AR) with minimum use of supplies delivered from Earth. During an initial stage of base construction is it most probable that water recovery and air revitalization systems based on physical/chemical means will be utilized. Space station crew life support via regenerative systems is effected as follows: potable water is recovered from humidity condensate through condensate sorption/catalytic purification in the SRW-K system. This system is used for purification of condensate from the system for water reclamation from urine, SRW-U, the carbon dioxide reduction system, CDRS and a green house; the remaining water is taken from supplies. Contaminated hygiene water is purified by means of membrane filtration and ion exchange in the SRW-H and re-used for personal hygiene. Crew urine is separated from carrier air, undergoes chemical pretreatment in the SPK-U system and then is fed to the system for water reclamation from urine, SRW-U. Trace contaminants are removed from the cabin atmosphere through sorption using regenerable sorbents and catalysis in the TCCS system. Carbon dioxide is removed from the cabin atmosphere by sorption using regenerable zeolites and amines in the TCCS system with CO2 desorption and its concentration in the CDRS system. CO2 catalytic methanation into water and methane is accomplished by the Sabatier reaction in the CDRS system (hydrogen is sent to the CDRS system from the oxygen generation system based on water electrolysis). Methane is vented to space and the water is used for water electrolysis. The CO2 processing system will be used in mining lunar soil. A green house produces a small amount of vegetables and is served as crew psychological support. The food is taken from supplies delivered. The closure coefficient for such a complex of regenerative life support systems is over 95