

HUMAN EXPLORATION OF THE MOON AND MARS SYMPOSIUM (A5)
Strategies to Establish Lunar and Mars Colonies (1)

Author: Ms. Sandra Oberhollenzer
Germany, s.oberhollenzer@gmail.com

AMINE RESIN PRELIMINARY TESTING FOR IN-SITU PROPELLANT PRODUCTION ON MARS

Abstract

One of the main items that will be needed in order for humans to be able to go to Mars will be propellant for their return. Studies have shown that in-situ production of this propellant on Mars, rather than carrying it from earth, can notably reduce initial lift-off mass. The simplest state to extract from in the Martian environment is a gas; hence the atmosphere, which contains over 95% carbon dioxide. Carbon dioxide can be converted via a Sabatier reaction and electrolysis to methane and (liquid) oxygen – a common bi-propellant combination, with a specific impulse around 360s. This paper suggests an absorption / desorption method using the diurnal temperature fluctuation of Mars to extract the CO₂ from the atmosphere. Preliminary tests were performed on an amine based resin at the ESA Propulsion Laboratory (EPL) to determine its suitability for this application. The resin is currently being used in the ARES system on the ISS as an air scrubber, using steam heating for desorption; here dry heating in low pressure was tested. Initial results showed that resin is a potential candidate. Further tests are planned to continue verification at a sub-system and then system level to validate the suitability of this method.