

Scientific Objective and Infrastructure of Space Exploration (1)  
Scientific Objective and Infrastructure of Space Exploration (2)

Author: Mr. Chongyang Wu  
Space Institute of Southern China(Shenzhen), China, wucy\_1990@163.com

Dr. Weidang Ai  
China Astronaut Research and Training Center, China, kangyongtang@163.com  
Prof. Qingni Yu  
National Key Laboratory of Human Factors Engineering, China Astronaut Research and Training Center&State Key Laboratory of Space Medicine Fundamentals and Application, China Astronaut Research and Training Center, China, yuqingni@139.com

Mr. Li Pan  
Space Institute of Southern China(Shenzhen), China, 543533949@qq.com

Mr. Li Chengxian  
Space Institute of Southern China(Shenzhen), China, 405358046@qq.com

SOLID WASTE PROCESSING AND RESOURCE RECOVERY IN 180-DAY CONTROLLED  
ECOLOGICAL LIFE SUPPORT SYSTEM INTEGRATED EXPERIMENT

**Abstract**

A six-month mission generated a number of solid wastes on controlled ecological life support system that must be treated to avoid health, storage room and resource wasting problems. The solid waste that generated from CELSS are collected and separated into reused waste and unregenerate waste. In this integrated experiment the unregenerate waste is household and work garbage, such as packaging, waste paper, used expendables and so on. They were compressed and stored in vacuum bags. The reused waste produced in the CELSS are inedible plant biomass and Human feces. Long term storage of unprocessed biological wastes and human wastes can present major health issues and a loss of potential resources, thus we select thermal drying, crushing, incineration and biodegradation for the conversion of reproducible waste to CO<sub>2</sub>, H<sub>2</sub>O, inorganics and manure for reuse. During 180-day CELSS integrated experiment 1527kg fresh inedible biomass, 96kg human feces, 121kg working garbage and 253kg domestic garbage were continually produced and disposed by different ways. 1164kg condensate water were recovered from fresh inedible biomass. Dry biomass were incinerated to CO<sub>2</sub> or mixed with feces as the filler of aerobic compost. CO<sub>2</sub>, H<sub>2</sub>O, inorganics and manure can be used for plant culturing. This paper reports the effect of waste management and resource recovery in the 180-day CELSS integrated experiment, which include following aspects: 1 the output of different type of solid waste. 2 the stabilization and security disposal of unregenerate waste. 3 the incineration of biomass. 4 the biodegradation of wheat straw and Human feces. 5 the flux of materials that contained within the reproducible waste.