Paper ID: 87624
oral

IAF SPACE EXPLORATION SYMPOSIUM (A3)
Interactive Presentations - IAF SPACE EXPLORATION SYMPOSIUM (IP)

Author: Mr. Hongbin Zhu
Innovation Academy for Microsatellites, Chinese Academy of Sciences, China

Ms. Qing Yu
Innovation Academy for Microsatellites, Chinese Academy of Sciences, China
Mr. Zhan Hu
Innovation Academy for Microsatellites, Chinese Academy of Sciences, China
Prof. Bin Wang
Innovation Academy for Microsatellites, Chinese Academy of Sciences, China

EXPERIMENTAL STUDY ON IRON AND OXYGEN PRODUCTION FROM FERRIC OXIDE BY HIGH POWER LASER PYROLYSIS FOR LUNAR IN-SITU RESOURCE UTILIZATION

Abstract

Along with the rapid growth of lunar exploration missions, in-situ resource utilization(ISRU) technology has attracted wide attention from the scientific community for meeting the requirements of lunar base construction and lunar scientific research. It's a new method to produce metal and oxygen by heating lunar soil with high power laser irradiation for lunar IRSU. In this study, a high power fiber laser was used to heat Fe_2O_3 in vacuum. Iron and oxygen were collected as experimental products. The effect of laser power, laser power density and laser irradiation time on the pyrolysis behavior of Fe_2O_3 was investigated for laser parameter optimization. Results show that the increase of laser power raise the temperature of ablation zone, which is conducive to accelerate the thermal decomposition reaction rate and increase the yield of the product. In addition, in the condition of a certain laser power, increasing the power density by reducing the spot size will make part of sample heating too fast. Fast heating leads to phenomena such as sample splitting and sputtering which reduce the products yield. Besides, both product yields increase first and then decreases with the increase of laser irradiation time in the condition of a certain laser power. This is mainly because the longer the irradiation time result in a higher temperature in laser irradiation area, which enhance products generation. But as the accumulation of laser energy increase with time, the sample runs out.