

IAF SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 3 (2C)

Author: Prof. Michèle Lavagna
Politecnico di Milano, Italy, michelle.lavagna@polimi.it

Mr. Giovanni Zanotti
Politecnico di Milano, Italy, giovanni.zanotti@polimi.it

Mr. Jacopo Prinetto
Politecnico di Milano, Italy, jacopo.prinetto@mail.polimi.it

Dr. Andrea Colagrossi
Politecnico di Milano, Italy, andrea.colagrossi@polimi.it

Dr. Paolo Lunghi
Politecnico di Milano, Italy, paolo.lunghi@polimi.it

Mr. Ivan Troisi
Politecnico di Milano, Italy, ivan.troisi@mail.polimi.it

OXYGEN EXTRACTION FROM LUNAR SOIL OXIDES: ON GROUND EXPERIMENTS AND
NUMERICAL MODELLING FOR THERMAL REDUCTION PROCESSES

Abstract

Space exploration is going to play a relevant role within the just started decade, with the Moon at its centre. Many activities are on going to enhance science of and from the Moon and to develop the fundamental technology to accomplish the challenging objectives the foreseen missions to our satellite need. Among those the capability to detect, extract and manipulate the in situ resources is central for humans back on the surface and more. Oxygen represents one of the primary resources a human base would need, therefore attention is focused on processes and technology to get this goal. The paper presents the activities performed to design and implement a significant laboratory plant to assess the yield of the thermal reduction to extract oxygen from the soil oxides; moreover the tests run to calibrate the facility and define the plant preparation procedures will be briefly shown. The process sensitivity experimental tests will be largely discussed, going through the obtained results. To deeply understand the on going process in each phase, a numerical model of the whole process steps has been implemented and a comprehensive characterisation of the feedstock simulant exploited in the ground tests was performed to correctly tune the model parameters and better drive the testing procedures. The paper goes through the simulant characterisation approach and results, the process description and modelling, the lab plant description and the experimental test campaign results, obtained with the implemented plant.