Lunar soil energy storage

Deep space exploration expands our understanding about the evolution history of solar system, while the future development heavily relies on the construction of energy systems and utilization of resources on the planet. This paper systematically reviewed the progress in the environmental control and construction technologies of space bases, extraterrestrial in situ resource utilization ...

chemical energy storage system has been proposed as a candidate for lunar energy storage. In the processing of lunar soil, Cat. is considered to be an unwanted by-product, but it has a ...

The main uncertainties were lunar soil weight, mass spectrometer analysis and cavity pipe adsorption when the water content was in the range of 0.008~1.7%. This analysis accuracy can effectively assess the lunar soil water content and can provide technical support for the assessment of surface water resources in the landing area.

The lunar regolith solar thermal storage power generation system based on lunar ISRU is a promising solution of energy supply challenge for long term lunar exploration. ...

ANALYSIS OF LUNAR REGOLITH THERMAL ENERGY STORAGE Anthony J. Colozza Sverdrup Technology Inc. Lewis Research Center Group Brook Park, Ohio 44142 ABSTRACT This study was performed to evaluate the concept of using lunar regolith as a thermal energy storage medium. The concept

Establishing an energy supply on the Moon is one tremendous challenge in research on the lunar environment due to limitations regarding the carrying capacity and cost of traditional means of rocket. In this paper, a lunar energy storage and conversion system based on in-situ resource utilization (LES-ISRU) is demonstrated, and its operating performance is ...

By day 16, there were clear physical differences between plants grown in the volcanic ash lunar simulant, left, compared with those grown in the lunar soil, right. UF/IFAS photo by Tyler Jones Additionally, the plants reacted differently depending on which sample - each collected from different areas on the Moon - was used.

The energy storage stroke of the penetrator was set to 30 mm, the impact frequency was 0.1 Hz, and the impact energy was 1.22 J. Lunar soil with relative compactness of 85% was adopted in the experiment. Firstly, the lunar soil simulant bucket was transferred to the designated working position. Then, the principal prototype of the impact ...

Analysis of Lunar Regolith Thermal Energy Storage Anthony J. Colozza Sverdrup Technology, Inc. Lewis Research Center Group Brook Park, Ohio November 199 1 Prepared for ... within the soil should go to zero (Jenson and Linsley, 1990). The boundary conditions for daytime heating were: T(rc,t) = 1800 K (10)

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On Earth, providing 100% of electricity demand 100% of the time solely from renewables, but without energy storage, is unfeasible. ... Lunar soil has the potential to generate oxygen and fuel. May ...

The focus of this thesis is to compare the thermal energy storage capabilities of sulphur concrete, polymer concrete and sintered Australian Lunar Regolith Simulant (ALRS - 1). ... The results showed that the highest specific heat capacity was 1.63kJ/kgK for the sintered lunar soil simulant, followed by 0.93kJ/kgK for the polymer concrete ...

Building a lunar base would be one of the next logical steps in our exploration of the Solar System, but the survival of a future crew depends on access to a reliable source of energy. An ESA Discovery & Preparation study explored how lunar regolith - the dust, soil and rock on the Moon"s surface - could be used to store heat and provide electricity for future ...

Can uninterrupted photovoltaic power feasibly be realized without energy storage? Although on planet Earth the answer appears to be negative, we depict and evaluate how it can be achieved on the Moon with a strategy that exploits the combination of the absence of a lunar atmosphere and the near-zero tilt of the Moon"s polar axis with respect to the ecliptic ...

A practical lunar based thermal energy storage system, based on locally available materials, could significantly reduce transportation requirements and associated costs of ... high melting temperatures of the lunar soil. Further, the increased period during which

There exist exotic proposals for thermal energy storage during the lunar night by running a heat engine powered by a heat exchanger pipe from a subsurface region of regolith melted during the lunar day. 97 Additionally, given that temperatures during the lunar night reach as low as 100 K globally and 40 K at the lunar poles, superconducting ...

Previous research has suggested that using lunar soil, which is abundant on the Moon"s surface, can significantly reduce the weight of cargo transported to the Moon ... and thermal energy storage from an ISRU perspective. They assessed the potential of SPS-sintered regolith for solar energy collection and thermal energy storage.

The penetration depth of microwave energy into the lunar soil is inversely proportional to the microwave frequency, i.e., higher frequency has shallow penetration depth ...

with background information regarding the solar illumination and the lunar soil. At the same time, an insight on regolith sintering techniques is given. These techniques are important as a means to providing thermal energy storage during the night cycle. After this, the core of the study is developed: The ideal system for energy storage is broken

Patrick et al. [13] proposed a power generation system that combines an in-situ lunar regolith resource heat storage system with a temperature difference generator, where the heat storage system acts as a heat source for the heat engine, which is made of sintered lunar soil and buried in the native lunar soil to reduce heat loss, generating ...

An ISRU approach as a means of energy provision is to use the lunar regolith as the medium for thermal energy storage (Balasubramaniam et al., 2010a, Climent et al., 2014), similar to the underground thermal energy storage concept used on Earth. Heat can be stored in solid materials (thermal mass) in the form of sensible heat.

Thermal Wadis are engineered solar energy storage systems that use modified regolith as a thermal storage mass.1 Wadis can store heat during the lunar day, and supply heat during the lunar night to rovers. They are good candidates to provide the required thermal energy for the survival of rovers and other equipment during periods of darkness.

The goal of the work was to compare the thermal properties of an Australian Lunar Simulant (ALS-1) with other materials and lunar regolith. For this, ALS-1 was sintered in an electric furnace to determine the Specific Heat Capacity (Cp) of the fused material. The resulting sample properties were evaluated with reference to thermal energy storage.

Lunar exploration faces unique energy supply challenges [4], [5], primarily due to the Moon"s distinctive geological environment.The absence of an atmosphere on the lunar surface results in a near-vacuum state, which prevents the formation of a greenhouse effect [6].During the lunar day, temperatures can rise to as 400 K, while during the lunar night, they drop to as 90 K ...

This work focuses on generating high-level system sizing relationships for two lunar surface locations that serve as bounding conditions for most other locations. Four critical parameters ...