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REGOLITH COMPOSITE FILMS FOR RADIATION DETECTION IN LUNAR HABITATS

Abstract

In the context of the Artemis program, aimed at returning humanity to the Moon to establish a sustainable presence and lay the groundwork for a new space era, there is an urgent need to ensure safety in future lunar structures. Factors such as micrometeoroid impacts, atomic oxygen, temperature cycles, and radiation pose significant threats to lunar habitats, presenting a crucial challenge in ensuring and maintaining astronaut safety.

This work presents a novel approach for lunar structures, aiming to enhance inhabitant safety by developing a concrete integrated with a visual indicator that responds to radiation levels in the lunar environment. This indicator, a combination of a photosensitive polymer and lunar regolith—a material that several space agencies have considered for lunar construction—offers an effective way to visually detect degradation on lunar structures caused by space conditions, thus facilitating streamlined maintenance efforts.

Research is currently active in institutions across various countries, including Mexico and the United States. The results obtained will act as a benchmark for the material's capabilities before it is sent to the Materials International Space Station Experiment (MISSE) module on the International Space Station, as part of the MISSE-21 mission scheduled for March 2025.

This experimentation seeks to validate the visual indicator's effectiveness under extreme space conditions, providing an essential tool for the early detection of wear and tear in lunar structures. The practical application of this technology aims not only to enhance safety and maintenance operations but also to lay the foundation for future lunar construction and exploration projects, thereby safeguarding the health of astronauts.

In summary, this innovative strategy will significantly contribute to the safety of lunar structures and the viability of future Moon-based projects, marking a step forward in the ongoing expansion of human exploration beyond Earth.