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ADVANCEMENTS IN LUNAR RESOURCE UTILIZATION FOR SUSTAINABLE SPACE EXPLORATION

Abstract

Lunar resource utilization holds immense promise for enabling sustainable and cost-effective space exploration beyond Earth's orbit. Significant advancements have been made in understanding and harnessing the vast array of resources available on the Moon, ranging from water ice to regolith minerals. This review article provides a comprehensive overview of the current state of knowledge and recent developments in lunar resource utilization, with a focus on supporting sustainable space exploration efforts. The types and distribution of lunar resources are discussed, highlighting their potential applications in space exploration, including life support and habitat construction. Building upon this foundation, various technologies and methods employed for extracting, processing, and utilizing lunar resources are reviewed, including mining and in-situ resource utilization (ISRU) techniques. Recent advancements in regolith processing and water extraction further underscore the potential of lunar resources to transform the field of space exploration. Looking ahead, the future prospects and implications of lunar resource utilization for space exploration are discussed. By reducing reliance on Earth-based resources and enabling sustained lunar habitation, the utilization of lunar resources holds the key to unlocking the full potential of human exploration of the Moon and beyond.