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Water in and on the Moon: Recent discoveries and future prospects

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Abstract

The Moon is Earth's nearest neighbor and the only other planetary body that has been visited by human beings. It is believed to have formed through a collision between the young Earth and an impactor ~ 4500 million years ago. The geological history of the Moon seems to be intimately associated with that of our own Earth. Therefore, through lunar studies, we can also gain further understanding of the geological evolution of the Earth especially that of the first 500 million years after the Earth formed – a crucial time period during which life arose on Earth.

Water is thought to have played a key role in the origin of life billions of years ago. Recent discoveries have highlighted the presence of water (as OH in minerals) in a variety of Moon rocks that were previously thought to be dry [e.g., 1], and the possibility that the water in the Earth-Moon system may share a common origin [2]. Finding of water in some of the oldest Moon rocks also raises the tantalizing possibility of delivery of organic material at the same time leading into the development of life on Earth. Furthermore, the H isotopic composition (i.e., the ratio of H to D) of water in lunar samples allows fingerprinting of their potential source(s) [2-4].

Prospecting resources on other planets is also important as the Earth runs low on resources. In this context, the presence of water on the Moon and in lunar materials has raised significant interests in the space exploration community for the potential of extracting water from lunar materials for In-Situ Resource Utilization (ISRU) purposes [5]. Another future possibility in this respect will be to explore an ISRU-based innovative construction process on the Moon applying ideas from recent research [e.g., 6].

Keywords: *Water, Life, Moon, ISRU, Space Exploration*

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