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Contribution of Moon Village to Solving Global Societal Issues (2)

Author: Dr. Hiroaki Kobayashi

Japan Aerospace Exploration Agency (JAXA), Japan, kobayashi.hiroaki@jaxa.jp

Prof. Yoshifumi Inatani

Japan Aerospace Exploration Agency (JAXA), Japan, inatani.yoshifumi@jaxa.jp

HYDROGEN ENERGY REALIZES A SUSTAINABLE DEVELOPMENT OF THE GLOBAL SPACE
AND MOON FOR FUTURE HUMANKIND

Abstract

In Japan, research and development in various fields have been carried out with the aim of realizing a hydrogen energy society. There are two motivations for Japan to realize the hydrogen energy society: (1) ensuring energy independence and (2) countermeasures against global warming. The goal is to build a carbon-free society that has no reliance on fossil energy, which is unevenly distributed on the earth. JAXA is contributing to the research and development of hydrogen energy-related technology in Japan, utilizing a large-scale hydrogen handling technology cultivated over many years of rocket development. The authors have obtained various hydrogen equipment technologies through joint research with various companies, and they have been fed back to a new reusable rocket development in JAXA. We believe that activities to build a sustainable society based on hydrogen may be compatible with the activities of Moon Village, which envisions a future society on the moon. As a result of the recent moon exploration, the possibility that water or hydrogen is present on the lunar surface has been increased, and studies on using this for a continuous space exploration have been conducted in various countries. Specifically, it is envisaged that mining water on the moon surface, liquefying and storing hydrogen and oxygen generated by solar power generation and water electrolysis equipment, and using this as a propellant and a chemical material. This concept is a hydrogen energy society on the moon, so it is expected that Japan's hydrogen technology acquired so far can be applied. On the other hand, there are some special considerations for using hydrogen in the moon. (1) Unlike the earth, where water is abundant, water is a rare substance in the Moon. Therefore, losses during the production and storage of hydrogen and oxygen must be minimized. (2) It is necessary to develop equipment technology for vacuum environments and temperature environments with large changes. It is important to consider how to exhaust heat from power devices. (3) In order to reduce transportation costs from the earth, it is necessary to develop equipment that is as light and compact as possible. As described above, in the use of hydrogen in the moon, it is necessary to realize more efficient equipment and hydrogen storage and utilization systems than the earth. These activities are expected to greatly contribute to the realization of the hydrogen society on the earth.