LUNAR LANDING SITE AND EXPLORATION BY JAPANESE LUNAR PROJECT: Miura Y.\textsuperscript{1,2} and Lunar Working Group of Japan\textsuperscript{3}. 'Fac. of Sci., Yamaguchi University, Yamaguchi 753, Japan, Tsukuba Space center, NASA of Japan, Tsukuba 305, Japan, and \textsuperscript{3}RESTEC, Roppongi 7-15-17, Minato-ku, Tokyo 106, Japan.

Japan is planning to select landing site and exploration on the Moon. The scientific significance of the project is now in progress to summarize. The main purpose of the paper is to discuss briefly the significance of characterization of lunar materials, especially about lunar materials on surfaces and deeper places from lunar resources and shocked materials [1].

1. Main purposes of lunar exploration

The Main purposes of lunar exploration are summarized as follows [1,2]:

1) Development of space resource: Space energy is developed on 'solar energy' from the Sun, including the solar components or metals reduced by the solar beam bombardments, and on synthesis of free oxygen and water in space.

2) Development of space and planetary sciences: From collecting the lunar samples, it can be discussed unsolved problems: origin of the Earth-Moon planetary bodies, unique impact samples originated from terrestrial ring fragments, origin of lunar meteorites on Antarctica and Australia. Lunar history of magma ocean activity and impact can be developed by mare basalts, pristine anorthosites, KREEPy rock, Mg-suite, lunar granite, lunar crust-mantle materials, and extra-lunar materials remained by impact. Earth history can be discussed from the origin of the Earth, giant ocean impact, and Earth interior evolution. Moon observatory on impact craters are searching on the nearside by using covering system.

3) Development of material science: New types analytical methods should be developed on X-ray and mass analyses, and finding the shocked materials of high-density and high pressure type minerals.

4) Maintenance of Earth's environment: To avoid the Earth's environmental changes (including life circulation system) by using terrestrial fossil energy, space resources can be utilized for development in space.

2. New foundings of shocked materials on the Moon

The following two types of shocked materials exist on the Moon [3,4]:

1) Shocked materials by impact on the Moon. Impact brecciated rocks are mainly formed on the lunar primordial crust. Shocked aggregates which include high-density and high-pressure grains are formed by impact (with and without atmosphere) [4], though original silica and carbon components are trace amounts on the Moon.

2) Moon-Earth unique brecciated rock: If lunar cataclysm which was perceived as a late spike in the cratering flux on about 3850 to 4000 m.y. was due to debris from the breakup of a large planetary bodies [5], the debris from the ring of primordial Earth and Mars-like can be collected on the surface or deeper place on nearside of the Moon.

3. Lunar landing site and exploration route

We are selected nine candidates for lunar landing site and exploration:
JAPANESE LUNAR EXPLORATION PROJECT: LWGJ

Mare Imbrium, Mare Humorum, Hevelius, Oceanus Procellarum, Mare Tranquillitatis, Mare Crisium, Mare Smythii, Mare Nectaris and Mare Serenitatis (Apollo-17 site).

One of the best candidates for lunar landing site is Mare Imbrium region because the typical impact craters, ejecta, regolith and resources can be found at the long distance exploration from Apennine Mts. Archimedes, Eratosthenes, to Copernicus craters by lunar roving vehicle. The main visiting route and lunar exploration are summarized in Table 1.

Table 1. Lunar driving route and exploration on Mare Imbrium region [3].

<table>
<thead>
<tr>
<th>Visiting place</th>
<th>Main research project</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Eastern Mare Imbrium:</td>
<td>Landing site-1, Impact cratering, Stratigraphy (Imbrian), Volcanism (lava, basalt), Solar and metallic energy, Habitation development, Weathering and erosion, Unique lunar materials</td>
<td>Near Apollo-15 site, Pre-Imbrian and Imbrian sediments</td>
</tr>
<tr>
<td>2) Archimedes crater:</td>
<td>Impact and volcanic materials, Resource materials</td>
<td>Imbrian crater, Impact ejecta</td>
</tr>
<tr>
<td>3) Apennine Mts:</td>
<td>Various sediments, Stratigraphy, Resource materials, Mixing of lunar highland, Lunar dark mantle materials</td>
<td>Crater rim, Cliff &amp; deeper place, Older igneous rocks</td>
</tr>
<tr>
<td>4) Eratosthenes crater:</td>
<td>Sediments (Eratosthenian), Impact &amp; resource materials</td>
<td>Impact crater, Impact ejecta</td>
</tr>
<tr>
<td>5) Copernicus crater:</td>
<td>Stratigraphy (Copernican), Impact &amp; resource materials</td>
<td>Impact crater, Younger lava</td>
</tr>
</tbody>
</table>

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References