

Exploration and characteristics of Moon-original and Earth-derived rocks on the Moon

Yasunori Miura[1]

[1] Earth Sci., Yamaguchi Univ

On the Moon there are major three types of Moon-original, extra-lunar except from the Earth, and Earth-derived rocks as follows.

Moon-original rocks are Apollo- and Luna-type rocks of anorthosites, norites and gabbros, breccias and melt rocks from the breccias on lunar Highland, whereas lunar Mare has basalt and melt rocks from breccias and basalt. On these rocks, the same type rocks with composition, but with different ages, are found on the Earth in anorthosite, norite and gabbros, breccias and complicated melt rocks, whereas space weathered soil and breccias called as agglutinates cannot be found on terrestrial rocks.

Extra-lunar rocks, except from the Earth, are remained rocks on the Moon from asteroid meteorites and comets which can be found on underground of the Moon or deeper sites of large impact craters on lunar Antarctica etc. Element isotopes from the solar winds can be found in lunar materials, though they are not rocks themselves.

Earth-derived rocks on the Moon are materials derived from big impacts on the Earth which are unknown materials through terrestrial atmosphere on the Moon without atmosphere.

On previous impact rocks on the Earth, there are not meteorite-type rocks with fusion crust and original meteorite rocks, but metamorphosed rocks without original rocks during impact on the target rocks.

On this sense, Earth-derived rocks on the Moon are considered to be glasses of tektites or spherules.

On the glassy rocks on the Moon, there are called as orange or green glasses with characteristic silicate composition from underground of the Moon through smaller veins.

The problem is how to find Earth-derived glasses or spherules in composition.

Characteristic large impacts on the Earth to fly to the Moon as ejecta are derived from geological boundaries, especially at the end of Permian Period. Target rocks at the Permian Period are limestone at sea-bottom, which typical spherules of carbon and Fe-Ni bearing particles have been reported. There are no large carbon spherules on the Moon due to no limestone target rocks, where carbon spherule can be also identify coexisting elements of target rocks. Fe-Ni bearing spherules from elements of asteroid meteorites which will be found as minor particles on the Moon, but it is also distinguished as coexisting elements of target rocks.

Glasses and spherules derived from the Earth by impacts can be weathered by the solar winds etc. on the Moon, which will be found as detailed survey of materials at underground of the Moon and sediment layers of the cliffs on the Moon in future lunar exploration.