Impact processes among the planetary materials are frequent cosmic events, considered to be so-called "traffic" impact accidents [1-6]. From the planetary material point of view, the quantitative analyses of the amorphous materials formed by impact processes are inevitable way to the next planetary researches and science projects [1-6]. The purposes of this study are to elucidate the amounts of the amorphous materials or brecciate materials formed by impact on the extraterrestrial materials, and to establish the high-speed and non-destructive quantitative analyses of amorphous substances.

The following preliminary results are summarized in this study (cf. Table 1):
1. The impact effects on the Apollo lunar samples (of soils and breccias) are about 80% [2, 4]. Bared rock samples of the lunar basalts are only about 20%, which is exceedingly different ratio with the terrestrial rocks covered by the atmosphere (cf. Table 1). The Mars samples covered by the Martian atmosphere are many basaltic rocks without major impact by the solar winds. The surface materials of the asteroids are the same amorphous materials formed by impact processes, mainly because there are no atmosphere on the asteroids. This suggests that the spectral research to the planetary materials (especially in the asteroids) has the difficulty of mineral identification into one phase. Thus, The surface materials of the asteroids should be checked by the possible mixtures of more than two phases or nonstoichiometric amorphous materials.
2. Amorphous plagioclases formed by impact (i.e. diaplectic labradorite glass) have about 4% larger volume (i.e. low density similar to that of the mafic mineral) than the terrestrial standards, whereas those in meteorite (i.e. maskelynite) have smaller volume (i.e. high density) [7]. But the amorphous plagioclases (i.e. diaplectic glass) hold the weak crystalline structure with a similar feldspar composition [5, 7].
3. X-ray diffraction method with the non-destructive quantitative analyzer on the amorphous (i.e. glassy) materials has not been reported previously. Even if the XRF apparatus has been applied to...
the glassy surface materials, the phase determination of the amorphous materials are difficult. The compact design of the X-ray non-destructive high-speed quantitative analyzer to the amorphous substances will be prepared for the planetary study.

Table 1. Amorphous (or glassy) materials and breccias formed by impact on the lunar samples and the other planetary surface materials.

<table>
<thead>
<tr>
<th>Samples</th>
<th>Crystalline rocks</th>
<th>Amorphous or impact rocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Earth</td>
<td>Major</td>
<td>Minor (by volcanism or meteoritic impact)</td>
</tr>
<tr>
<td>The Moon</td>
<td>21% (in the lunar basalts)</td>
<td>79% (soil, breccias etc.)</td>
</tr>
<tr>
<td>The Mars</td>
<td>Major (less than the terrestrial rocks)</td>
<td>Minor (more than the terrestrial one)</td>
</tr>
<tr>
<td>The Asteroids</td>
<td>Minor</td>
<td>Major</td>
</tr>
</tbody>
</table>

REFERENCES: