EXPERIMENTAL STUDY OF RELATION BETWEEN POROSITY AND STATIC AND IMPACT STRENGTH OF SINTERED TARGETS

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Porous structure is common in asteroids and satellites of the outer planets. In order to study the relation between the structure of the small bodies and their thermal and collisional evolution, we measured the static strength and impact strength of porous sintered targets and examined the correlation between these values with the sintering conditions and porosity.

Samples are soda lime glass beads of diameter 50 micron, nominal density 2.49 g/cm3 and softening point 734 degree in C. Heating of these glass beads under the softeing temperature increases adhesion between particles, i.e., so called sintering rogresses.

Strength of sintered glass targets was investigated by Love et al. (1993) and Michikami (2001) about targets that were heated 4 hours. In this study, the heating temperature was varied from 600 to 700 degree in C and the heating duration was varied from 10 to 240 minutes and we tried to make targets with same porosity under different sintering conditions. As a result, we obtained targets with porosity between 30 and 45 %. The microstructure of the targets was investigated using a scanning electron microscope. The porosity was changed largely with the heating temperature in the case of fixed heating duration. On the other hand, the porosity was almost unchanged while the necks between the particles grow with time when we fixed the heating temperature but changed the heating duration.

We investigate static compressive strength of these targets by uniaxial compression testing and destruction strength by impact experiments using a gas gun. We will examine the influence of porosity upon compressive strength and impact strength. Furthermore, we will consider the change of strength occurring due to the neck growth despite of almost constant porosity.