

Experimental study for the effect of the centrifugal force on collisional process

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Recent observation revealed that many asteroids rotate sufficiently rapid near the rotational stability limit. It is inferred that the centrifugal force in spinning asteroid affects the conditions on collisional fragmentation. However impact experiment with rotating target hardly has been performed because it is difficult to keep the stability of the rotating porous samples, simulated rubble pile structure. Furthermore, recent study of impact cratering onto regolith surface revealed that cohesion between particles of more than several ten microns in diameter could not be ignored. In this study we performed rotating-target experiments using powder aggregates or particles in order to investigate the effect of the centrifugal force and the cohesion between particles.

We developed sample-rotating machine using a DC motor and conducted experiments with this machine. Spin rate was 30 to 3000 rpm. Samples were glass beads of 5 microns to 5 mm in diameter and put into a cylindrical tray. The increase of the outer-most height of the samples with spin rate was recorded by high speed video camera.

It has been considered that particles less than several-micron in diameter behave cohesive like powders, whereas particles larger than several tens micron in diameter behave cohesiveless like granular materials. However our results suggested that the behavior of 500-micron glass beads was similar to that of 50-micron glass beads and much different from 5-mm glass beads. It is inferred that the effect of the cohesion on sub-mm particles can not be ignored on the impact cratering.