

# LABORATORY IMPACT DISRUPTION EXPERIMENTS - TOWARDS UNDERSTANDING THE IMPACT PROCESS OF POROUS BODIES

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Laboratory studies on the impact process of small bodies have been performed in recent decades using light-gas guns and other facilities (Holsapple et al. 2002). These experimental studies have provided quantitative data and insights into many aspects of centimeter-scale impact processes, especially for brittle solid targets. Close-up views of boulders on asteroid 25143 Itokawa showed that the boulders are strikingly similar to laboratory rock impact fragments in terms of shape and structure, despite the orders of magnitude difference in scale (Nakamura et al. 2007), encouraging experimental approaches.

However, since laboratory experiments are limited in scale, numerical simulation and scaling methods have been adopted in order to extend the laboratory results to the scales of small bodies. With such extended studies, the flaw statistics of the target body are a key parameters that determines the outcome of impact disruption. To date, the flaw statistics have been studied for a few target materials used in impact disruption experiments directly and indirectly (Housen and Holsapple 1999, Nakamura et al. 2006). With porous bodies, pores play important complicated roles in impact disruption: pores stop crack-growth, while they suppress the transmission efficiency of the impact energy throughout the body. It is therefore impact experiments using porous targets are required in order to understand the physical processes involved and establish a database that can serve as a useful reference for numerical modeling and the scaling approach.

We started impact disruption experiments of porous targets with different strength and porosity. The target materials used include sintered glass beads (Setoh et al. 2007), gypsum, and pumice. The porosity of the targets ranged from a few percent to 70% and the compressive strength ranged from under 1 MPa to over tens of MPa. The microscopic structures of the target materials differed from one another and was characterized using microscopic imaging. In parallel with the impact experiments, other studies have examined how materials lose their porosity under static compression (Hiraoka and Nakamura, this meeting). The results of the impact experiments of these targets will be briefly summarized.

**References** Housen K., and Holsapple, K., 1999; *Icarus*, 142, 21-33. Holsapple, K., et al. 2002; in *Asteroids III*, p.443-462. Nakamura, A. M., Michel, P., and Setoh, M., 2006; *J. Geophys. Res.*, 112, 10.1029/2006JE002757. Nakamura, A. M. et al., 2007; *Earth, Planets, Space*, in press. Setoh, M. et al., 2007; *Earth, Planets, Space*, in press.