HYPERVELOCITY IMPACT EXPERIMENTS TO STUDY CRATERIZATION AND CATASTROPHIC FRAGMENTATION OF MINOR BODIES IN THE SOLAR SYSTEM

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A deeper understanding of impact fragmentation and of collisional breakup processes is needed to investigate the evolution of the minor bodies of the Solar System and also for developing more complete and accurate theoretical models. We present an experimental study of impact cratering and fragmentation processes onto low density materials by means of high velocity impact experiments using a two-stage light-gas gun, the impact facility of CISAS "G. Colombo" of the University of Padova (http://cisas.unipd.it/lgg/lgg.html). The goal of our experiments is to obtain a better comprehension of the impact processes on different materials in order to analyse the evolution of planetary surfaces and the collisional evolution of the minor bodies of the Solar System and to support the space missions to asteroids and comets for data interpretation, mission design and risk mitigation. Porosity is an important physical characteristic of the minor bodies, affecting their behaviour during cratering and greatly lengthening the collisional lifetimes of asteroids. Therefore we focus on the study of impact processes on porous targets both by experimental and theoretical approach in order to complement and extend the available data to ranges of velocity and physical conditions not yet explored. Impact test campaigns have been performed on samples of different material and porosity in order to study the craterization up to catastrophic disruption. Furthermore, numerical simulations have been performed by using Smooth Particle hydrodynamics (SPH) technique in order to validate the experimental data. Results of the study of impact processes on porous targets will be presented also in comparison with other experimental data.