Acceleration of projectiles using a high-power laser

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Impact velocity of meteorites on planets and satellites at the final stage of planetary accretion becomes more than 10 km/s. However, macroscopic (larger than 0.1 mm) projectiles are not easily accelerated to more than 10 km/s by two-stage light-gas guns. One possible method to a velocity larger than 10 km/s is the irradiation of high-intensity lasers. Here, we describe the first results of projectile (spheres) acceleration experiments to a velocity higher than 10 km/s using GEKKO XII laser at Institute of Laser Engineering. Projectiles are accelerated to a velocity of 15 km/s. This is enough to simulate hypervelocity impacts on the surface of the proto-planets and investigate various phenomena caused by the impacts such as impact vaporization of silicate rocks, crater and ejecta formation on rocks, and metamorphism due to high pressure.