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Introduction: Hypervelocity impacts are common in the Solar System, in particular during its early phases when primitive bodies of contrasted composition collided. Whether these objects are chemically modified during impacts, and by what kind of processes, e.g., chemical mixing or gas-liquid-solid fractionation, are still pending questions. To address these issues, a set of impact experiments involving a multi-elemental doped basaltic projectile and a metallic target was performed in a 3-7 km/s range of impact speeds typical of those occurring in the asteroid belt. Remote observations, laboratory experiments and theoretical models [1-2] having demonstrated that collisions could lead to complex processes of mass transfer and mixing between both projectile and target materials, our projectile was doped with trace elements in order to better track the chemical fractionation at work during these high energy events.

Experimental: Impact experiments were performed using a 7-mm bore two-stage light-gas gun at the Institute of Space and Astronautical Science (ISAS) in Japan. Spheroidal projectiles of about 3 mm in diameter were all shot vertically to the target surface using a plastic sabot. A square aluminum witness plate of side 28 cm with a central hole 4 cm in diameter allowing the projectile to go through was placed in front of the target. Aluminum small plates of the order of cm in width were fixed on the aluminum witness plate. These plates were used to collect ejecta from the impact. The trajectory is captured with a high-speed video camera (frame rate of 4 µs) that monitors the experiment. The projectile composition has been selected to be close to that of a phonolitic lava (55-60 wt% SiO_2 and ~15 wt% Na_2O+K_2O), and doped with 15 trace elements (Ba, Ce, Cs, Co, Ga, La, Nb, Rb, Sc, Sr, Ta, V, Y, Yb, Zr) ranging in concentrations from 300 to 1000 ppm. For each run, both texture and chemistry of the crater and the ejecta population have been characterized.

Results: The results [3] show that the melted projectiles largely cover the craters at all speeds, and that basaltic impact melt materials are injected in fractures in the crater in the metallic target. Ejecta are generally quenched droplet of silicate impact melt containing metal beads. LA-ICP-MS analyses suggest however that no volatility-controlled chemical fractionation of trace elements is recorded by the ejecta within uncertainties. Implications of these findings for M-type asteroids will be then discussed.

References: [1] Ebert, M et al. 2014. *GCA*, *133*, 257-279. [2] Hamann, C., et al., 2016. *GCA, 192*, 295-317. [3] C. Ganino et al. In press, Impact-induced chemical fractionation as inferred from hypervelocity impact experiments with silicate projectiles and metallic targets. *Meteoritics.*