High velocity impacts and related chemical fractionations

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Impact cratering has been, and still is, a major process in the evolution of all the solid bodies of the solar system but relatively few experimental studies addressed both the physical and chemical dissemination of the projectile during the impact process. These experiments demonstrated the importance of melting, vaporization, and mixing of projectile and target in the cratering process and some of them described fractionation processes during melting and mixing of molten projectile and target material. To extend this result, we performed 3 hypervelocity cratering experiments at 3, 5, and 7 km/s, using a ~3mm-spheric projectile of basaltic glass doped in 27 trace elements, and iron alloy as target material. The ejecta, collected in an aluminium catcher, were analysed using EDX-SEM and LA-ICPMS techniques. Due to the entire melting of the projectile, ejecta consist in all runs in 10s of μm diameter - solidified droplet of various shapes that impacted the Al collector from different ballistic trajectories. Irrespective of the incident velocities, our preliminary results show a specific iron enrichment of the ejecta and a strong Si enrichment in the target fragment for which we cannot reject the hypothesis of a mechanical mixing. The trace element analyses do not show however any evidences for a significant elemental fractionation between the projectile and the ejecta. The implications of these results will be discussed.