

# Hypervelocity Impact Craters in Ceramics and Rocks

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## **Abstract**

Impact craters are observed throughout the solar system, and impact is one of the dominant processes in planetary science. Impact craters are also observed in critical engineering applications, including protective structures, satellites, and space telescopes. Using temporally resolved in situ diagnostics, we examine the evolution of impact craters in ceramics and rocks for a range of impact velocities up to 5 km/s. Through fundamental modeling of dynamic failure processes coupled with computational simulations, we examine the mechanics of impact, dynamic fracture, and fragmentation associated with impact cratering. We focus on advanced ceramics like boron carbide, competent rocks like basalt, and porous rocks like sandstone. Finally, we compare existing theory for the evolution of impact craters with our time-resolved observations.

## **Keywords:**

impact experiments mechanism-based models crater evolution Dynamic behavior