

The shape distributions of sub-mm-sized impact experiment fragments from Allende meteorite

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Several spacecraft have shown that kilometer-sized or smaller asteroids, such as Itokawa, Ryugu and Bennu, are covered with regolith particles. The shapes of regolith particles are considered clues to understanding their formation and evolution on asteroid surface. Ryugu particles are likely fragments resulting from impacts on the asteroid's surface. However, there has been a lack of laboratory impact experiments specifically examining the shapes of fragments in carbonaceous chondrites, which originate from carbonaceous asteroids like Ryugu and Bennu. In this study, we take the first step towards a better understanding of the shapes of impact fragments in carbonaceous chondrites. We conducted an impact experiment on the carbonaceous meteorite Allende and investigated the shape distributions of sub-mm-sized impact fragments using X-ray microtomography. As a result, we observed many fragments cross-sections along the chondrule boundary. In addition, these fragments tended to be rounder than previously observed impact fragment shapes. However, because the total number of these fragments is relatively small, the overall shape distribution of the fragments was found to be the same as that of previous impact fragment shapes. This finding will be useful for understanding the formation process of regolith layers on the asteroid surface, Itokawa particles, Ryugu particles, and Bennu particles scheduled to return to Earth.