MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Fluid and Materials Sciences (2)

Author: Prof.Dr. Yuren WANG
National Microgravity Laboratory, Institute of Mechanics, Chinese Academy of Sciences., China,
Yurenwang@imech.ac.cn

STEEL BALL IMPACT ON THE GRANULAR BED IN MICROGRAVITY

Abstract

Various kinds of collision processes, such as meteorolite collision on a planet surface, are filled with in space. The physics involved can be studied through the experiments of solid ball impacting on granular medium. The ground based experiments show that a splashing crown and a transient crater are generated when a solid sphere impacts on a bed filled with granular medium. Gravity is usually considered as the driven force for the granular jet formation. The jet formation physics were extensively discussed in many related research papers. In this paper, we reported a drop-tower experiment performed to investigate impact of a steel ball on granular bed in microgravity. Performing these experiments in a zero gravity environment may advance our understanding of physics involved in this collision process. High speed video recorded the whole impact process in microgravity. It was found that the granular jet formed in microgravity has a big difference from the ground-based experiment. The recoiling granular jet formation strongly related to the density of granular medium in the microgravity experiment. For impact on a loose granular bed, the granular jet disappeared. Instead, a rapidly expanding granular surface wave was observed. In another hand, the granular jet can be found in the experiment of impact on a dense granular bed. The microgravity experiment shows that an empty cavity was formed on the way of ball impacting. Compared with ground based experiment, it shows that the gravity driven collapse of granular medium was the main cause for the jet formation.