

Spectroscopic Study of Luminous Efficiency using Hypervelocity Impact Experiment toward understanding Lunar Impact Flash Phenomena

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When a meteoroid impacts on the Moon, a brief flash phenomenon, called as a lunar impact flash, is observed by ground-based telescope. Its statistical detections can efficiently evaluate the meteoroid size frequency distribution in Cis-lunar space. Luminous efficiency that is a ratio of impactor's kinetic energy to luminous energy is the most important parameter for the precise meteoroid size estimation. Thus, it is necessary to understand the impact flash mechanism and luminous efficiency in various conditions. We performed hypervelocity impact experiments at JAXA, and measured interactions between luminous efficiency and ambient atmosphere in various vacuum level. Based on the obtained high-speed spectra (1Mfps: 1 μ s), it is found that the flash sources are blackbody radiation from hot ejecta and molecular bands (and atomic lines) from vapor cloud. The spectrum analysis results reveal that luminous efficiency of μ s order depends on ambient pressure, whereas that of ms order does not.