

Experimental study of the sputtered secondary ion yields from the lunar surface

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There are few in-situ heavy ion observations from lunar soil or tenuous alkali atmosphere. It is commonly thought that these heavy ions around the Moon are mainly produced by ion-induced desorption (sputtering) or photon-stimulated desorption from the lunar surface and by the photoionization from the atmosphere. Once ions are produced, they are picked up and accelerated by the motional solar wind electric field $E = -\mathbf{V} \times \mathbf{B}$, where \mathbf{V} is the plasma bulk velocity and \mathbf{B} the magnetic field. In this case most of them will escape from lunar orbit, because the gyroradius is much greater than the lunar radius.

IMA (Ion Mass Analyzer) on board the SELENE satellite will measure these picked-up ions around the Moon in order to investigate the production mechanisms and make the global surface compositional map of the Moon. In the observations at the lunar orbit, the production rate of the secondary ions by the solar-wind sputtering is one of the significant parameters, because it directly affects the flux of picked-up ions around the Moon.

In this study we performed the laboratory experiments that simulated the lunar surface sputtering in order to understand how the solar wind sputters secondary ions from the lunar surface. We present the result of laboratory measurements of sputtered secondary ion yields from the lunar soil simulants by using the IMA. Moreover, we compare the result with SIMS analysis of same simulants.