Investigation of Lunar Erosion by Volatilized Alkalis

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Abstract—Comminution of lunar rocks may be caused partly by the action of volatilized alkali metals. From step-wise heating in a Knutsen cell - mass spectrometer, and in a cold finger collector furnace, lunar samples are found to evaporate Al, Ca, Fe, Mg and Si, as well as the alkali metals. Of the latter, K exhibits a high vapor pressure relative to Na, out of proportion to their relative contents in the rock samples.

Evidence suggestive of erosion by K in particular is: (1) from electron microprobe studies, regions of significantly high K content are found on or near the original rock surfaces. Some show an anticorrelation with Si, so at least these do not seem to be related to mesostasis. (2) A high content of K was found in the basaltic component of the lunar fines examined, when compared to the accompanying rocks from which presumably they were derived. (3) On heating, a high Na-K ratio is found in vapors from terrestrial rocks eroded by K, as compared to
non-treated rocks--an effect that seems to be diagnostic for the former. A similar anomalous release ratio has been noted for lunar surface rocks and fines samples, relative to that found for rock interiors--suggesting the presence of surficial K on the original rock surfaces and fines.