ABSTRACT FOR SECOND ANNUAL LUNAR SCIENCE CONFERENCE

CHEMISTRY OF LUNAR BASALTS AND THEIR ORIGIN AND CONSTRAINTS ON THE COMPOSITION OF THE LUNAR INTERIOR

by

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The soil and rock samples from five out of six of the first points on the moon where chemical data are available are chemically similar to terrestrial basalts. The lunar samples consistently differ from terrestrial basalts in several important respects:

1) They have lower Na contents.
2) They have higher Fe content.
3) Fe_2O_3 is absent.
4) The abundances of Eu and Sr are unique when compared to other lithophile elements.
5) The REE + Ba and U + Th are not fractionated relative to each other; the heavy REE are much more variable than they are in terrestrial basalts.

These similarities and dissimilarities can be plausibly explained by assuming that the lunar basalts are produced by partial melting of a non-chondritic mantle consisting of plagioclase, orthopyroxene, clinopyroxene, and minor amounts of olivine.

The degree of partial melting required to produce the observed chemical composition varies by at least a factor of 5.

The composition of the lunar interior inferred from the basalt chemistry implies a strong enrichment in refractory ions and depletion in volatile elements. Both of these observations can be accounted for by specifying temperatures where the material that made up the moon separated from a gas rich primitive solar nebulae.

These temperatures imply that most of the Fe in the moon should be there as metallic Fe; this is not observed. It is suggested that metallic Fe does not condense out of the solar nebulae.