DOES THE LUNAR CRUST HAVE A EUROPIUM ANOMALY? Randy L. Korotev and Larry A. Haskin, Dept. of Earth & Planetary Sciences, Washington Univ., St. Louis, MO 63130

Lunar anorthosites such as 15415 and 60025 have chondrite-normalized concentrations of Eu which are high by about a factor of 50 compared to the concentrations of neighboring rare-earth elements (REE). The lunar highlands are regarded as being 'anorthositic' because of the high concentration of Al_2O_3 (25-27%). This can lead to a perception that the lunar highlands crust has a positve Eu anomaly as well. The estimates of Taylor for the composition of the lunar crust do indicate a positive Eu anomaly (Fig. 5.20 of [1], Fig. 5.27 of [2]). The complementary REE patterns of the lunar crust (presumed positive Eu anomaly, negative slope) and the mare basalts or their source regions (negative Eu anomaly, positive slope) are noted in discussions of lunar differentiation (Fig. 7.1 of [1]; Fig. 6.40 of [2]; Fig. 3 of [3]).

Several authors have observed that the lunar meteorites ALHA81005 and Y79-1197 have compositions similar to estimates of the bulk composition of the lunar crust and that these meteorites must have come from a region(s) of the Moon distant from the Apollo landing sites [4,5,6]. It seems fruitful to reexamine the crustal Eu-anomaly issue and include the data from these valuable samples. Fig. 1 shows the frequency distribution of Th concentrations in nonmare regions based on results from the orbiting gamma-ray experiments on Apollo 15 and 16 (using the live-time data in [7]). The farside has a lower mean Th concentration than does the nearside. Also plotted in Fig. 1 is the Sm/Eu ratio as a function of Th concentration in nonmare samples from Apollo 11, 15, 16, and 17, Luna 16 and 20, as well as the two lunar meteorites. The data are primarily for samples that are polymict, i.e., soils and breccias, although some nearly monomict breccia clasts are included. The plot shows that samples from a variety of locations follow a general trend of increasing Sm/Eu ratio with increasing Th concentration. The trend results because the concentrations of the lithophile elements Sm and Th are more variable than is the concentration of the 'plagiophile' [8] element Eu. The horizontal lines represent the narrow range of Sm/Eu ratios in chondrites (2.62-2.66). The dotted vertical line is the best estimate of the mean Th concentration of the highlands surface based on results of the orbiting gamma-ray experiments (0.91 ug/g [7]). Because the intersection of the lines falls within the trend of the sample data, the plot implies that on the average, the lunar highlands surface has no Eu anomaly, positive or negative. Although typical farside highlands have a positive Eu anomaly and typical nearside highlands have a negative one, if the mean surface concentrations are representative of the upper crust, then the average upper crust has no significant Eu anomaly. If the bulk Moon has chondritic proportions of Sm, Eu, and Th, then the lunar surface is not enriched (or depleted) in plagioclase (the principal carrier of Eu) relative to the liquid from which the plagioclase crystallized (the principal carrier of Sm and Th), although there is a lateral separation. In this case, the lunar surface is not enriched in plagioclase but depleted in mafic minerals which do not concentrate Sm, Th, or Eu.

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