OXYGEN ISOTOPIC COMPOSITION OF ALHA 81005; Toshiko K. Mayeda and Robert N. Clayton, Enrico Fermi Institute, University of Chicago, Chicago, Illinois 60637.

The various planetary bodies and meteorite parent bodies have characteristic oxygen isotopic compositions established at the time of their accretion (1). The differences arise both from mass-dependent fractionation processes and from variable degrees of mixing of components of different nucleosynthetic origins. The major groups of achondritic meteorites form four different groups on the oxygen three-isotope graph: I eucrites, howardites, diogenites, mesosiderites, and pallasites; II shergottites, nakhlites, and chassignites; III aubrites; IV ureilites. All of these except the aubrites lie on mass-fractionation lines either richer or poorer in ^{16}O with respect to the terrestrial fractionation line. The rocks of the Moon are very homogeneous in oxygen isotopes and have a composition lying on the terrestrial fractionation line at a point within the range of terrestrial mantle rocks (2). Thus, the oxygen isotopic composition of the Moon is distinctly different from that of all meteorites except the aubrites.

Table 1 shows isotopic data for ALHA 81005 along with data for eucrites and a lunar highlands breccia, analyzed at the same time for comparison. ALHA 81005 is identical in isotopic composition with the Apollo 16 breccia, and is distinctly different from the eucrite samples. Of all the known sources of solar system rocks, only the Earth, the Moon, and the aubrite parent body have oxygen compositions compatible with that of ALHA 81005. Chemical data eliminate the Earth and aubrite parent as candidates, leaving the Moon as the likely origin.

TABLE 1

Oxygen Isotopic Compositions of ALHA 81005, Lunar Rocks, and Eucrites

Sample No.	Description	$\delta^{18}O$ (‰)	$\delta^{17}O$ (‰)	$\delta^{17} - 0.52\delta^{18}$
ALHA 81005,19	Anorthositic clast	5.48	2.92	+0.07
ALHA 81005,19	Whole rock	5.86	3.03	-0.02
60015,72	Lunar anorthosite	5.57	2.95	+0.05
60015,58	Lunar glass	5.59	2.94	+0.03
ALHA 79004,43	Eucrite clast C	3.37	1.53	-0.22
ALHA 79004,50	Eucrite clast F	3.53	1.59	-0.25
ALHA 79004,53	Eucrite matrix	3.40	1.60	-0.17
Serra de Magé	Whole rock	3.68	1.67	-0.24
Juvinas	Plagioclase	3.78	1.71	-0.26

References

(1) Clayton R. N. and Mayeda T. K. (1976) Earth Planet. Sci. Lett. 30, 10-18.
(2) Clayton R. N. and Mayeda T. K. (1975) Proc. Lunar Sci. Conf. 6th, 1761-1769.