OBSERVATIONS ON ^{204}Pb, Bi, Tl AND Zn IN APOLLO 17 SAMPLES*

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Some observations on the heavy metals in Apollo 17 samples, their interrelations and their relations to the heavy metals in other lunar samples are summarized. Two unusual samples, 74220 and 66095, are important in relation to these heavy trace elements. A detailed report along with data has been submitted elsewhere (1). Some other observations not elaborated on previously are included here.

1. ^{204}Pb, Tl and Zn remaining in Apollo 17 samples after dilute acid (pH 5-6) leaching are correlated with one another.

2. These metal fractions are apparently associated with the submicron Fe° found in the agglutinates. The ^{204}Pb correlation with Fe° was noted before (2). Since agglutination is an on-going process; a continuous supply of heavy metals must be maintained. If the small leachable fractions of the metals are the reservoirs then they must be continuously replenished.

3. In the Apollo 17 samples the ^{204}Pb, Bi and Tl intercorrelations include orange soil 74220. The fact that these elements are correlated with both agglutinate (Fe° is correlated with agglutinate content) and orange glass requires a special process which is probably not dependent on the modes of formation of these two types of glassy material.

Rusty rock 66095, a breccia, plays a role in correlations involving lunar samples from several landing sites. The cases in which 74220 and 66095 are involved are listed in Table 1. The uniqueness of the division into 74220 and 66095 groups is underscored when it is further noted that the heavy element and the halogen enrichment patterns are different in 74220 and 66095. It should also be noted that the role of 74220 is localized whereas that of 66095 is widespread.

4. A shadow (76241) and an exposed skim reference (76261) sample were measured. The leachable Bi and ^{204}Pb are 3-10 times enriched in the shadowed soil, Table 2. This could result from deposition of volatiles on cold surfaces in the shadow or removal of surface volatiles from exposed surfaces of the control sample. The non-leachable fractions of the heavy metals in the shadow sample are enriched by 10-50%. This might support the second alternative, i.e. removal of heavy metals from the exposed sample. The great sensitivity of the labile metal fractions only to mobilization processes probably accounts for the general failure to observe evidence for volatile transport by other investigators.

Preliminary data from leaching and volatilization experiments support the greater volatility of ^{204}Pb relative to the other heavy elements in agreement with the trend noted in Table 2.

Observations on ^{204}Pb,

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(1) Allen, R. O., Jr., et al., Apollo 17 Heavy Element Affinities, submitted. (2) Allen, R. O., Jr., et al., (1974) Proc. Lunar Science Conf. 5th, p. 1617-1623. *Work performed under the auspices of the USAEC and NASA. **Present address: Dept. of Chem.,University of Virginia, Charlottesville, Va.

Table 1. Roles of 74220 and 66095

Correlated Element Pairs*	74220	66095
Zn_r - $^{204}Pb_r$	17 soils:S. Massif(2), mare(1)**	17 breccias(2), 16 breccias(1)
Tl_r - ^{204}Pb	17 soils:S. Massif(2), mare(3)	14 soils(3),breccia(1), 16 soils(4)
Tl_r - Zn_r	17 soils:Massifs(4), mare(2)	--
Bi_r - $^{204}Pb_r$	--	17 soils(4),15 soils (1), 14 soils(3)
Bi_r - P_2O_5	17 soils: all	--
Br_ℓ(I_ℓ,Cl_ℓ)- ^{204}Pb	15 soils(2), 14 soils(2)	17 soils:Massif(2), mare(1), 16 soils(3), 17 breccia(1)

*X_r = residue after water or dilute acid (pH 5-6) leach, X_ℓ = leach. Samples studied include 71501, 72701, 73141, 74220, 75080, 76241, 76261, 72225, 76315 and Apollo 14, 15 and 16 samples previously reported by Allen, et al. in L.S.C. volumes.

Table 2. Relative heavy metal contents in a shadowed 76241 vs an exposed 76261 soil.

76241/76261	Pb	Bi	Tl	Zn
Residue Ratio	1.5	1.4	1.2	1.3
Leach Ratio	11	2.8	1.1	0.8