LEAD ISOTOPE SYSTEMATICS OF LEACHED METEORITIC MINERALS;

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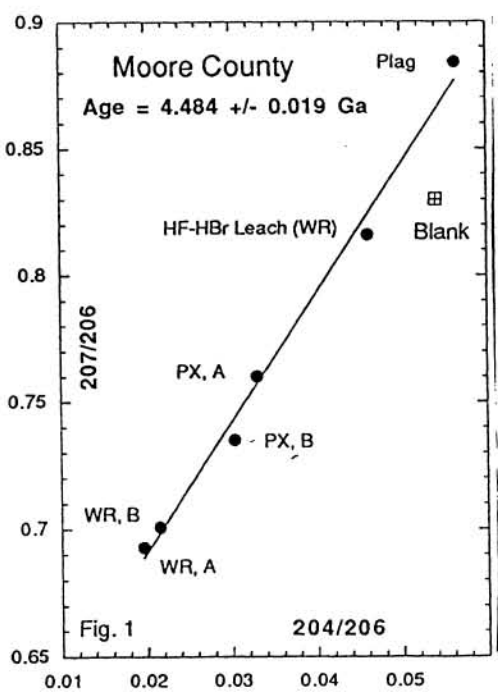
The generally low Pb concentrations in meteorites coupled with the pervasiveness of Pb on earth, often requires acid-leaching of meteoritic matter in order to remove the terrestrial contamination. Besides discussing this application, we draw attention to some "side effects" of leaching on the Pb isotope systematics:

I. Although contaminated, Moore County samples obtained from 1 cm depth below the fusion crust, loose their contamination to 2N HBr. The minerals of this cumulate eucrite yield an age of 4.484 Ga (Fig. 1) which, within errors, is in agreement with the Sm-Nd age of this meteorite. Two other members of the class, Serra de Mage and Moama give Pb-Pb isochron ages of 4.399 and 4.426 Ga respectively (1). As pointed out before (2) this indicates that the cumulate eucrites are generally younger than the non cumulate ones, which give ages older than 4.50 Ga (2).

II. Dilute acid (2N HBr) removes soluble Pb in accessory minerals, variably enriched in U and Th. For a given meteorite, the major rock-forming minerals left behind, have the same Th/ ^{238}U, as indicated by their falling on a straight line in Pb correlation diagrams involving ^{208}Pb. Examples are shown for Moama and Serra de Mage (Figs 2 & 3). Similar results exist for four other meteorites (not shown).

III.The value of radiogenic (^{208}Pb/^{206}Pb)* in fig. 2 is 2% lower than the value obtained if (^{207}Pb/^{206}Pb) is the X axis. Similarly (^{208}Pb/^{206}Pb)* in Fig. 3 is 3% higher than what is determined from the intercept if (^{204}Pb/^{206}Pb) is the X axis (compare figs.3 & 6). Because of this disparity, the calculated K_2 = (Th/^{238}U) for the minerals is correspondingly uncertain.

IV. The disparity mentioned in III is consistent with preferential leaching of uranogenic ^{207}Pb & ^{206}Pb relative to thorogenic ^{208}Pb, and may result from more damage to the crystal lattice by the fast decaying ^{235}U. If this preferential loss is recent, it should not perceptibly affect (^{207}Pb/^{206}Pb)* but *may* seriously affect U-Pb dating, particularly in conjunction with fine time-resolution.



V. Further evidence for preferential leaching of uranogenic Pb is indicated by false and exceptionally high K_1 value calculated for a meteorite's source (or parent) from the inferred (^{208}Pb/^{204}Pb)$_{initial}$. The latter as well as K_1 are determined by correlating three types of diagrams as shown in figs 4, 5 & 6, for Serra de Mage. Because of the meteorite's old age, a two-stage model may be a good approximation to reality. In the calculation presented, the first stage began at 4.556 Ga: The radiogenic initial lead (207/206)* is calculated from T (age of the source) and t (isochron age), then is used in figs 4 & 5 to obtain initial (207/206) in two ways, denoted I_a for fig. 4 and I_b for fig. 5. Also from fig. 5, initial (208/206) is obtained. The latter is used in fig. 6 to obtain the corresponding initial (204/206), denoted $(1/\alpha)_b$. For Serra de Mage and four other eucrites we observe $I_a > I_b$ and $(1/\alpha)_a > (1/\alpha)_b$, which is consistent with preferential loss of uranogenic Pb.

REFERENCES [1] Tera F. et al. (1989) *lunar and Planet. Sci.* XX, 1111. [2] Carlson R. W. et al. (1988) *lunar and Planet. Sci.* XIX, 166.

Fig. 1 Isochron of Moore county ("interior" samples).

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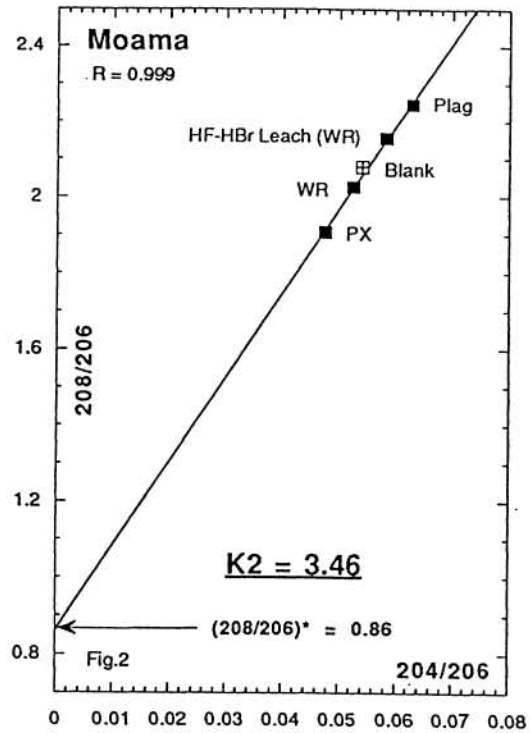

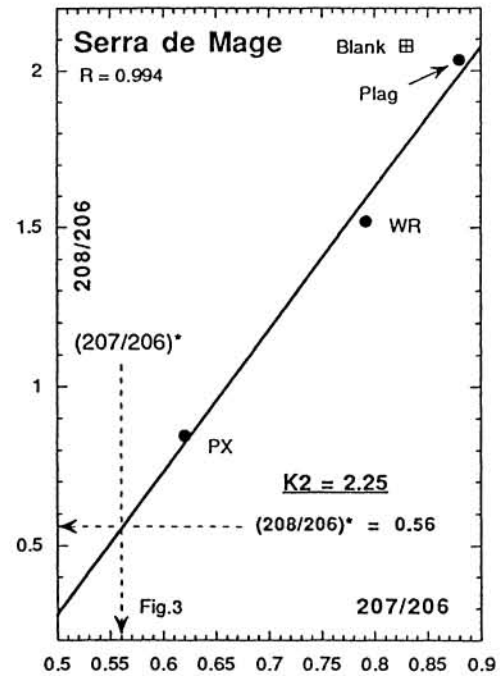

Fig. 2 Leached Moama separates define a line with an intercept yielding $K_2 = Th/^{238}U = 3.5$. **Fig. 3** $^{208,207,206}Pb$ correlation for Serra de Mage. (207/206)* of the meteorite is used to obtain its (208/206)*. Note deviation from fig 6. **Fig. 4** Assuming an age of 4.556 Ga for a parent starting from primordial lead (PAT), $\mu_1 = (^{238}U/^{204}Pb) = 14$ is determined, as well as initial ratios denoted I_a and $(I/\alpha)_a$. **Fig. 5** Same two-stage model is applied in a correlation involving ^{208}Pb. Note $I_b < I_a$, due to increase in $^{208}Pb/^{206}Pb$, caused by preferential leaching of ^{206}Pb. **Fig. 6** Using intial $^{208}Pb/^{206}Pb$ from fig. 5, a second determination of initial $1/\alpha$ is obtained, which differs from that in fig. 4.

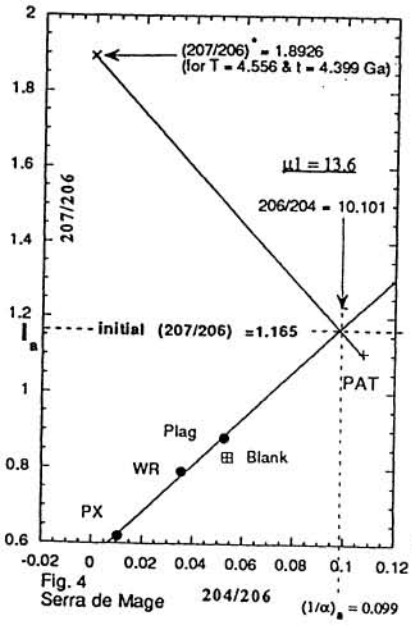

Fig. 4
Serra de Mage

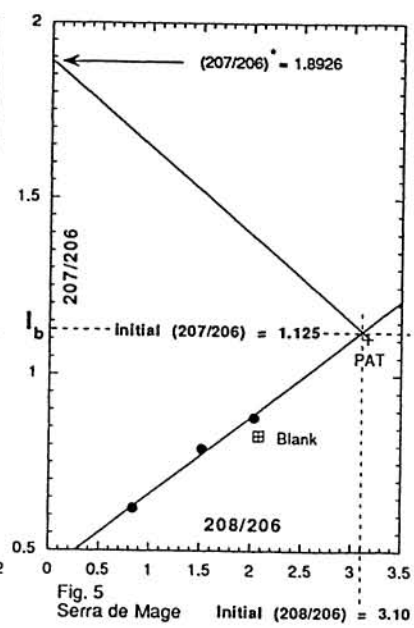

Fig. 5
Serra de Mage

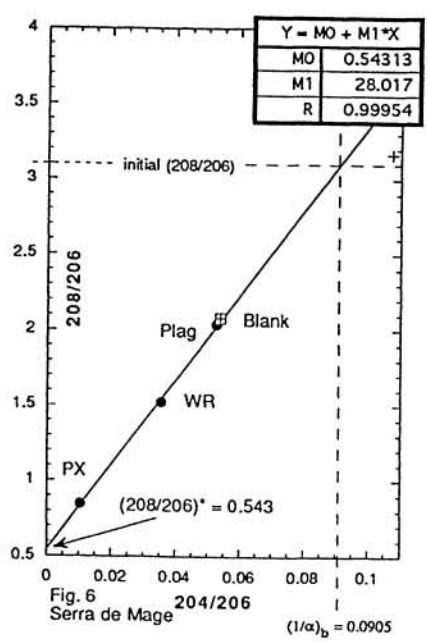

Fig. 6
Serra de Mage