"PRE-COMPACTION" COSMOGENIC XENON IN KRYMKA CHONDRITE

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During the stepwise heating of a strong-magnetic fraction of the Krymka LL3 chondrite, it was found that the low-temperature fractions (500-700 °C) are enriched in the light Xe isotopes: $^{124-131}$Xe. The quantity of ^{126}Xe was higher by a factor of five than the value calculated for production of cosmogenic ^{126}Xe using average target contents and the Krymka ^{21}Ne-radiation age. Also, the ratio ^{124}Xe/^{126}Xe = 0.76 ± 0.03 obtained from a three isotope diagram is much higher than corresponding values usually observed in stony meteorites and lunar matter (i.e. 0.50-0.65) from the production on Ba and REE (1). We can not exclude some addition of Xe-L which could be the reason for an increased ^{124}Xe/^{126}Xe. However, a strong linear correlation in ^{124}Xe/^{130}Xe vs. ^{126}Xe/^{130}Xe apparently shows the presence of only two components (trapped and cosmogenic). Thus, the elevated $(^{124}Xe/^{126}Xe)_{cosm}$ (cosm = cosmogenic) ratio is more likely explained by unusual irradiation parameters and/or by production from targets other than Ba and REE. Besides, large excesses of ^{128}Xe and ^{131}Xe were found with $(^{128}Xe/^{126}Xe)_{cosm}$ = 14 ± 3 and $(^{131}Xe/^{126}Xe)_{cosm}$ ≈ 10. Such high values can be explained by (n,τ) reactions and require large neutron fluences suggesting burial at an efficient shielding depth. Apparently, all these findings together indicate the presence of a cosmogenic component which was produced near the surface of a relatively large parent body during early irradiation.

The other feature of this Xe_{cosm} component is that the cosmogenic isotopes are contained only in the same temperature fractions which are enriched in Xe-H. It was shown earlier (2), that chromite and carbonaceous phases rich in Xe-H in Krymka, Hamlet, Parnalle and Chainpur chondrites also contain excesses of $^{21}Ne_{cosm}$ and, probably, $^{38}Ar_{cosm}$. Thus, the combined presence of Xe-H and spallation products may indicate a "pre-compaction" origin for Xe_{cosm}. The quantity of $^{126}Xe_{cosm}$ corresponds to an exposure age of at least ~140 m.y. for the <u>bulk</u> strong-magnetic fraction of Krymka (assuming contemporary cosmic ray intensity). If the Xe-H rich phases in Krymka are all enriched in volatile elements, as is the case for at least the carbonaceous phase discussed in (3), the most likely targets (except Ba and REE) are Pb, Bi and other heavy volatile metals. For such a scenario the elevated value of $(^{124}Xe/^{126}Xe)_{cosm}$ could be easily explained.

The most likely reason for the correlated light and heavy Xe isotopes from the strong-magnetic fraction in Krymka is the preservation of both Xe-H and "pre-compaction" Xe_{cosm} in the same mineral grains which were only very slightly altered during secondary events. If that is the case and the observed correlation is not accidental, one can expect that the presence of the "pre-compaction" Xe_{cosm} in mineral grains which contain Xe-H may be found in many objects.

Carbonaceous chondrites are highest in Xe-H, but trapped Xe and the Xe-L contents are too high to resolve a small quantity of Xe_{cosm}. Ordinary chondrites are more suitable. Analysis of the available stepwise heating data for Stavropol, Bakhardok (in which enormously large values of ^{128}Xe were observed), Mordvinovka, Zhigailovka, and Kuleshovka chondrites showed a definitive similarity among the extraction curves of the heavy Xe isotopes and Xe_{cosm}. However, such effects observed in these LL5-6 chondrites can easily be explained by the enrichment in heavy isotopes due to ^{244}Pu and/or ^{238}U fission rather than the presence of Xe-H. The magnitude of the enrichment in heavy isotopes is insufficient to distinguish these components exactly.

In conclusion, the excesses in Krymka of $^{126}Xe_{cosm}$ and $^{128}Xe_{cosm}$ and the similarity among the extraction curves discussed above indicate the existence of a Xe component which is due to early irradiation in a relatively deep regolith. The presence of such a component in more equilibrated chondrites is doubtful but cannot be completely excluded. Particularly from the Krymka results it appears important to analyze more unequilibrated ordinary chondrites to shed further light on the possible ubiquity of this "pre-compaction" component.

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