FEASIBILITY OF IODINE AND BROMINE ANALYSIS IN GENESIS SOLAR WIND COLLECTORS.

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Comparison of elemental abundances in sun, meteorites and earth provides understanding of the formation and evolution of the solar system. Yet, the majority of the solar system abundances are based on meteoritic values [1–6]. Here we report an attempt to estimate a feasibility of direct measurements of iodine and bromine in the GENESIS solar wind Aluminum on Sapphire collector (AloS) using neutron induced conversions: $^{127}I(n,\gamma\beta)^{128}Xe$, $^{79}Br(n,\gamma\beta)^{80}Kr$ and $^{81}Br(n,\gamma\beta)^{82}Kr$.

To estimate the extent of terrestrial halogen contamination in GENESIS collectors, several flown fragments of AloS were submerged in methanol (for 1 hour and for 48 hours), rinsed in methanol, dried, sealed under vacuum in fused quartz ampoules and irradiated at the Missouri University Research Reactor receiving fluence ~ 2×10^{19} thermal neutrons /cm^2.

We analyzed two areas (0.07cm^2 and 0.7 cm^2) of AloS the solar wind collector washed for 48 hours, and one area (0.13cm^2) of the collector washed for 1 hour. Xenon extracted from the largest area had a clear signature of solar wind as indicated by $^{129}Xe/^{132}Xe$ = 1.045 ± 0.005 and other major isotopes, while $^{128}Xe/^{132}Xe$ = 1.01 ± 0.03 had a 12-fold excess compared to the solar value. Longer washing apparently reduces iodine contamination 4 times, implying that it is surface correlated. Evidently, to separate ^{128}Xe, derived from solar iodine, and the solar wind ^{128}Xe, the iodine contamination should be reduced further, at least 10 times. It may be achieved by combination of a longer and more aggressive cleaning procedure (i. e. ozone cleaning followed by washing in non-polar solvents at elevated temperatures) and depth-profiling laser extraction.

Krypton analyses of the irradiated AloS collectors demonstrates solar wind signature with 17% excess in ^{82}Kr and 3-fold excess in ^{80}Kr. Apparently, cleaning in methanol is much more efficient for Br that for I, since a longer 48-hour washing reduced bromine contamination 50 times.

Our first “quick and dirty” experiment suggests that determination of solar iodine and bromine is potentially feasible, especially considering availability of cleaner Si-based Genesis collectors and the possibility of analyzing larger collector areas irradiated with tripled neutron fluence.

This work is supported by NASA grant NNX07AM76G.

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