Solar abundances of Bromine and Iodine: Feasibility of measurements in Genesis mission collectors

O. PRAVDIVTSEVA[1]*, A. MESHIK[1], D. S. BURNETT[2]

[1]Physics Department, Washington University, St. Louis, MO 63130, USA (olga@physics.wustl.edu)
[2]Division of Geology and Planetary Sciences, CalTech, Pasadena, CA 91125, USA

The majority of the solar system abundances are based on meteoritic values [1–4]. Direct measurement of solar abundances could verify this approach and improve our understanding of the formation and evolution of the solar system. Genesis mission already provided valuable information on solar wind (SW) abundances for O, N, noble gases and several other elements. Here we estimate a feasibility of measurements of iodine and bromine in the Genesis collectors using neutron induced conversions: $^{127}I(n,\gamma\beta)^{128}Xe$, $^{79}Br(n,\gamma\beta)^{80}Kr$ and $^{81}Br(n,\gamma\beta)^{82}Kr$. Our exploratory analysis of neutron irradiated Aluminum on Sapphire collector (AloS) [5] demonstrated high terrestrial I and Br contents throughout the target material, making it unsuitable for SW I and Br analyses. Since then we analyzed Silicon on Sapphire (SoS) and Sapphire (SAP) collectors. To remove surface terrestrial halogen contamination all SW collectors were cleaned following protocol developed for AloS. The samples were sealed in fused quartz ampoules under vacuum and irradiated to thermal neutron fluence of $\sim 2\times10^{19}$ n/cm^2. Xe and Kr were extracted by laser ablation and analyzed using 8-multiplier Noblesse mass spectrometer (NU-Instruments). Special care was taken to avoid change-of-charge effect caused by residual ^{40}Ar.

SW target	Total	Blank	Br-derived
AloS [5]	3720	84	3636
SoS	300	60	240
SAP, back side	510	16	494
SAP, front side	13.2	12.6	0.6

Table 1. ^{80}Kr (×1000 atoms/cm^2) in Genesis SW collectors.

Based on Kr data (Table1), SAP collectors are most suitable for the detection of solar halogens. The experiment with flown SAP Genesis collector is currently under way.

Supported by NASA grant NNX13AD14G.

[1] Anders & Ebihara (1982) *GCA* **46**:2363–2380. [2] Anders & Grevesse (1989) *GCA* **53**:197– 214. [3] Cameron (1973) *Space Sci Rev* **15**:121–146. [4] Lodders (2010) in: Principles and Perspectives in Cosmochem. 379–417. [5] Pravdivtseva et al. (2011) *74th Met. Soc. Meeting*, A5509.