NANOSIMS MEASUREMENTS OF SOLAR WIND MG, FE AND CR FLUENCES.

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Introduction: The chemical composition of the Sun provides the reference standard for a wide variety of astronomical, cosmochemical and geochemical studies. To better determine the solar composition, the Genesis spacecraft collected solar wind at the L1 point in the space for 27 months prior to returning samples to Earth in September 2004. Prior ion probe analyses of Genesis samples have found discrepant results for the Mg and Fe solar wind fluences from different collector materials [1]. We report measurements of Mg, Fe and Cr depth profiles in Genesis diamond-like C sample 60062 using the Carnegie Institution Cameca NanoSIMS 50L ion microprobe. Our results for Mg and Fe are similar to previous analyses of the same sample using different instruments.

Experimental: The very high primary beam density of the NanoSIMS allows smaller craters to be analyzed compared to the ims-6f and ims-1270 ion probes used for previous work. For this study, a 4 nA -16kV O^- primary beam of about 2 μm in diameter was rastered at 25×25 μm^2 on the sample surface with positive secondary ions extracted from the central 25% of the rastered area. Masses ^{12}C, ^{24}Mg, ^{25}Mg, ^{52}Cr, ^{54}Fe and ^{56}Fe were measured simultaneously to a depth of about 500 nm from the surface. ^{25}Mg and ^{54}Fe implanted standards were measured before, after and in between sample analyses to quantify relative fluences. Since no Cr implant standard was available at the time of our analyses, we used the relative sensitivity factors in diamond reported by [2] to quantify Cr fluences. We analyzed 10 craters with one showing abnormally low ^{12}C count rates and thus excluded. One crater showed significant surface contamination of Fe and no Fe data could be deduced.

Results: We found a Mg fluence of $4.33\pm0.26\times10^{12}$ cm^{-2} and an Fe fluence of $2.39\pm0.15\times10^{12}$ cm^{-2} for sample 60062. These are in good agreement with previous measurement of the same samples by ims-6f [1]. As seen before, the fluences derived from diamond-like C are higher than those from Si collectors; an explanation for this discrepancy is still lacking but the results from Si are preferred. Based on three ^{52}Cr depth profiles, we estimated a Cr fluence of 2.2×10^{11} cm^{-2}. This value is about seven times higher than that found in Si by [1]. However, surface contamination for this sample is apparently a contributing factor. The $^{25}Mg/^{24}Mg$ ratios derived from the profiles are slightly elevated (by up to ~10%) compared to the terrestrial value, probably indicating a large contribution of MgH to the ^{25}Mg signal in the flight sample. Further measurements at higher mass resolution will provide more accurate isotopic abundances. Analyses of additional elements and collector materials also will be conducted to get more accurate data of the solar wind composition and to understand differences between different collector materials.

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References: [1] Burnett D. S. et al. 2007. Abstract #1843. 38th Lunar & Planetary Science Conference. [2] Wilson R. G. 1997. *Int. J. Mass Spectr. and Ion Proc.* 143:43-49.