Depth distribution of solar wind He implanted into NASA Genesis targets.

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NASA's *Genesis* solar wind sample return mission is a unique experiment which allows us to probe the physics of ion-solid interaction by the solar wind and will provide an experimental basis for the analysis of natural samples irradiated by solar wind. For the first time, depth profiling of solar wind ^{4}He has been done on a *Genesis* diamond-like-carbon film on silicon substrate (DOS) sample: Sputtered neutral mass spectrometry (SNMS) with post-photoionization by strong field was used. Ion intensities of the post-ionized isotopes were converted to concentrations by comparing with ion intensities from a DOS standard that was implanted $^4He^+$ ions of 15 keV.

The depth profile represents a measured layer of 140 nm in depth and a size of 2.5 × 4 μm^2. The peak concentration of implanted solar wind ^{4}He is about 2.2×10^{20} cm^{-3} at ~20 nm in depth. The implantation profile is traced to 100 nm in depth until the blank level is reached which result from ^{4}He from the photo-ionization of residual ^{4}He gas in the vacuum and from sputtered ^{4}He absorbed on the surface from the vacuum during measurements. The blank corresponds to ~3×10^{18} cm^{-3}. The solar wind ^{4}He fluence calculated by the depth-profiling method (~8.5×10^{14} cm^{-2}) is consistent with those determined by previous laboratory measurements.

The solar wind ^{4}He distribution in the DOS sample was compared with a calculated distribution by TRIM using the solar wind energy distribution during *Genesis* mission by ACE/SWICS. The projected range, peak concentration and concentration at a given depth are simulated by TRIM if an appropriate density parameter is adopted. Assuming He has the highest mobility of all elements other than H, this analysis demonstrates that all solar-wind elements heavier than H are completely intact in this *Genesis* collector material. Consequently, the solar-wind energy distribution can, ideally, be calculated from measured depth profiles, and the profiles can be useful for understanding ancient solar activities experienced by natural samples, as well as space weathering evolution of solar system objects.