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SOLAR NEON RELEASED FROM GENESIS ALUMINUM COLLECTOR DURIUNG STEPPED UV-LASER EXTRACTION AND STEP-WISE PYROLYSIS

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Earlier this year we reported results of UV-laser stepped raster extractions of Ne and He from Genesis' Al-collector [1]. Since then, using pyrolysis of a 0.005 cm^2 fragment of this material left from the earlier study, we have estimated the efficiency of the UV-laser extraction to be at least 95%. We also analyzed Ne released from the Al-collector by means of stepped pyrolysis. Here we compare these new data with stepped UV-laser extraction and the CSSE results [2]. Figure 1 shows the $^{20}Ne/^{22}Ne$ ratio extracted from Genesis collectors using these three techniques.

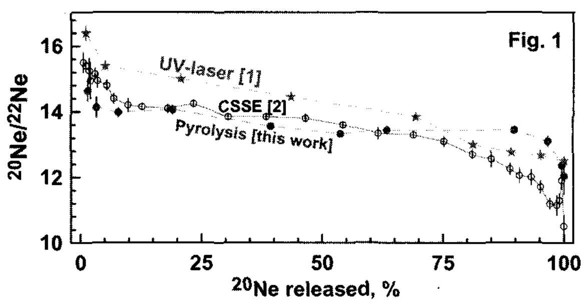

Fig. 1

The common feature in these different extraction methods is the profile of the $^{20}Ne/^{22}Ne$ ratios. In the beginning the ratios are elevated, then relatively flat in the middle, and lowest at the end of the extractions. This pattern seems to be due to the different implantation depths for ^{20}Ne and ^{22}Ne and agrees with isotopic fractionation expected from SRIM calculations [3].

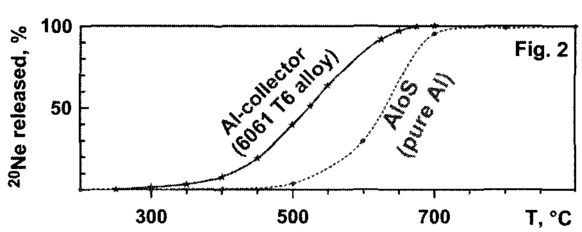

Fig. 2

Comparison of Ne release profiles from the Al-collector and pure Al-coated sapphire (AloS, [4]) reveals significant differences between these materials (Fig. 2), suggesting that AloS may retain noble gases better than the Al-collector. This may explain slightly higher Ne and He fluxes observed in bulk AloS collector [5] relative to those measured in the Al-collector [1].

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LIFE AFTER SHOCK: THE MISSION FROM MARS TO EARTH

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Introduction: In view of the geological and climatological development of planet Mars, the origin and evolution of life in the first 1.5 billion years of Martian history appears possible. There is also convincing evidence that a significant amount of surface material was ejected from Mars by impact processes and a substantial portion of that transferred to Earth. The minerals of the Martian meteorites collected so far indicate an exposure to shock waves in the pressure range of 5–55 GPa [1]. As terrestrial rocks are frequently inhabited by microbial communities, rocks ejected from a planet by impact processes may carry with them endolithic microorganisms, if microbial life existed/exists on this planet.

Experiment: We produced planar shock waves by an explosive device, which accelerates a planar flyer plate. The plate impacted an Armco iron container, in which the sample, an assemblage of different kinds of microorganisms and rock, was placed parallel to the shock front. Independently of the peak shock pressure predetermined by the dimensions and material properties of the experimental setup, the actual peak shock pressure of the recovered shocked material was controlled by measurement of the refractive indices of plagioclase, based on accurate calibration for shock pressure (e.g., [2]).

Based on the experience with shock recovery experiments at an ambient temperature of 293 K [3], we performed a new set of experiments to extend the temperature conditions to 233 K and 193 K, respectively, in order to better simulate the Martian temperature environment (147–290 K). Considering the detailed knowledge about the composition and constitution of Martian surface rocks and the well-known relation between shock pressure and post-shock temperature for various types of rocks, we used dunite (corresponding to the Martian chassignite meteorites) on the one hand, and sedimentary rock (sandstone) saturated with water and salt on the other hand, as an extension of our earlier work with gabbro [3]. Dunite is the rock of choice because of a relatively low increase of shock and post-shock temperature after shock loading [1]. Sandstone served as an analog of the Martian water-saturated regolith.

Conclusions: The aim of these experiments was to determine the temperature or pressure as the limiting factor for the survival rate of microorganisms during shock loading and to better understand the underlying molecular mechanisms of the survival of microorganisms in an impact and ejection scenario.

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