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Title:
In-situ Measurements Of The Radiolytic Destruction Of Glycine In Ices: Applications To The Martian Subsurface

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Abstract:
Amino acids and other organic molecules are thought to be easily destroyed on the surface of Mars by the high flux of incident ultraviolet rays or by chemical interactions with oxidizing substances in the soil. However, organic molecules may survive in the subsurface, where chemical processes are driven by penetrating galactic cosmic rays such as MeV protons. Models of the radiation dose as a function of depth on Mars have shown that the contribution of galactic cosmic rays dominates from about one centimeter to a few meters [1]. Theoretical models have also been published to aid in understanding molecular destruction at these depths, but these usually are based on room-temperature laboratory data, studies of single-component samples, and ex-situ methods of chemical analysis. Recent studies of amino-acid survivability include those involving UV photolysis [2, 3] and gamma radiolysis [4], but nearly all chemical and kinetic analyses from such experiments involved room-temperature measurements on samples irradiated and then removed from sealed containers.
We report new laboratory studies of the radiation-induced destruction of glycine-containing ices. *In-situ* infrared spectroscopy was used to study decay rates as a function of temperature and initial glycine concentrations. Our results indicate that glycine's destruction rate depends on temperature, the presence of H2O-ice, and the initial relative abundance of glycine. These trends are not obvious in previous work, suggesting that room-temperature measurements on pure glycine's radiation stability are not directly applicable to Mars and other environments.
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[2] ten Kate, I. L., et al., 2006. Planet. Space Sci. 54, 296-302.
[3] Orzechowska, G. E., et al., 2007. Icarus 187, 584-591.
[4] Kminek, G., Bada, J. L., 2006. Earth Planet. Sci. Lett. 245, 1-5.

Category:
Mars: Surface and Interior

Additional Information (Complete):

Did you give a contributed presentation in 2010 (Pasadena)?: No
Did you give a contributed presentation in 2011 (Nantes)?: No
Student Status: None
I am willing to serve as a Chair: Yes
(1) Area of Expertise: Laboratory Research
I have a video for Press Officer review: No
Newsworthy?: No

Status: Complete

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