Abstract Spectra of Jupiter's icy satellites reveal surfaces dominated by H2O-ice with minor amounts of SO2 and other materials. The co-existence of H2O and SO2 in surfaces exposed to jovian magnetospheric radiation suggests that sulfuric acid (H2SO4) also could be present. This was noted by Carlson et al. (1999), who supported this suggestion with assignments of near-IR bands in Europa spectra to hydrated H2SO4. Laboratory experiments since have demonstrated radiolytically-driven syntheses in S- and SO2-containing H2O-ices (Carlson et al., 2002; Moore et al., 2006).

In the Cosmic Ice Laboratory, we recently have investigated the thermal chemistry of SO2 trapped in H2O-ice. IR spectra of H2O + SO2 mixtures recorded at 10 to 230 K were used to follow low-temperature reactions in the absence of radiation effects. No SO2 reactions were found at 10 K, but warming to more-relevant Europa temperatures produced both HSO3- and S2O52-. Added NH3 shifted the product composition toward SO32- and away from the other ions. We find that H2O and SO2 react to produce sulfur oxyanions, such as bisulfite, that as much as 30% of the SO2 can be consumed through this reaction, and that the products remain in the ice when the temperature is lowered, indicating that these reactions are irreversible. Our results suggest that thermally-induced reactions can alter the chemistry at and below the surfaces of the icy satellites in the jovian system.

This work was supported by NASA's Planetary Geology and Geophysics and Planetary Atmospheres programs, and the NASA Astrobiology Institute's Goddard Center for Astrobiology.

References:

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42nd DPS Program published in BAAS volume 42 #4, 2010.

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Presentation

54.06 - The Other Chemistry of the Jovian Icy Satellites - Low Energy and Sulfurous

Reggie L. Hudson¹, M. J. Loeffler¹, M. H. Moore¹
¹NASA Goddard Space Flight Center.

Session

Oral

54. Galilean Satellites II

Friday, October 8, 2010

9:00 - 10:00 AM

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