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

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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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Carlson, R. W., Anderson, M. S., Johnson, R. E., Schulman, M. B., Yavrouian, A. H., 2002, *Icarus* 157, 456-463.
Moore, M. H., Hudson, R. L., and Carlson, R. W., 2007, *Icarus*, 189, 409-423.

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

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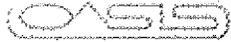
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