

## Abstract

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#### Thermal Reactions between Sulfur Dioxide and H<sub>2</sub>O<sub>2</sub> and their Relevance to the Jovian Icy Satellites and Other Small Bodies

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Laboratory experiments have demonstrated that magnetospheric radiation in the Jovian system drives reaction chemistry in ices at temperatures relevant to Europa and other icy satellites. Here we present new results on thermally-induced reactions occurring between 50 and 130 K in solid H<sub>2</sub>O + H<sub>2</sub>O<sub>2</sub> + SO<sub>2</sub> samples. In our studies, we find that warming our three component mixtures induces a thermal reaction that produces SO<sub>4</sub><sup>2-</sup>, and this reaction appears to consume equal amounts of H<sub>2</sub>O<sub>2</sub> and SO<sub>2</sub>. We suspect that the results may explain some of the observations related to the presence and distribution of H<sub>2</sub>O<sub>2</sub> across Europa's surface as well as the lack of H<sub>2</sub>O<sub>2</sub> on Ganymede and Callisto. If other molecules prove to be reactive with H<sub>2</sub>O<sub>2</sub> at these or at even lower temperatures, then it may also explain why H<sub>2</sub>O<sub>2</sub> has been absent from surfaces of many of the small icy bodies that are known to be exposed to ionizing radiation.

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