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VUV photoabsorption spectroscopy of amorphous and crystalline sulphur dioxide films.

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Abstract.

Sulphur dioxide, SO_2 is one of the simplest sulphur compounds and has been observed widely in the interstellar medium and in the solar system. It has also been observed in the atmospheres of Venus and Io and on the surface of Europa. Gaseous sulphur dioxide has recently been observed for the first time in the extragalactic medium. (Martin.S, et al(1979)) Five SO_2 transitions detected towards NGC 253 with a total column density of 7 x 10^{13} cm^{-1} have been reported. SO_2 is also present on Io, in solid, liquid and gaseous form. For example solid phase SO_2 was suggested as the source for the 4.05-4.08 μm feature of SO_2 seen in the spectrum of Io (Smythe, Nelson & Nash (1979)),(Fanale, F.P., et al(1979)). To date most studies of SO_2 spectroscopy have been in the gaseous phase with only a few experiments reported on solid SO_2. We have used the UV1 beam line on the ASTRID synchrotron based at the University of Aarhus in Denmark to measure the VUV spectrum of condensed phase SO_2 over the range of 120 – 350 nm and in the temperature range of 25 – 80 K. (For a full description of our equipment see Dawes, Holtom & Mason (2003)) In this poster we report the results of a detailed study of the spectroscopy of solid SO_2 in the VUV and UV. At 25 K the VUV spectrum for a fast deposited film (2.8 μ m/hr) suggests an amorphous ice layer is formed, in contrast a slow deposition (0.21 μ m/hr) suggests that a more crystalline ice is formed. Annealing (heating of the 25 K fast deposited ice) to 80 K revealed a phase change producing crystalline SO_2 ice from the originally amorphous sample. Such spectroscopic features might be used to determine thermal histories of planetary ice. Further details will be presented at the conference.

Keywords. astrobiology, planets and satellites: general, ISM: molecules, ultraviolet: ISM.

References

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