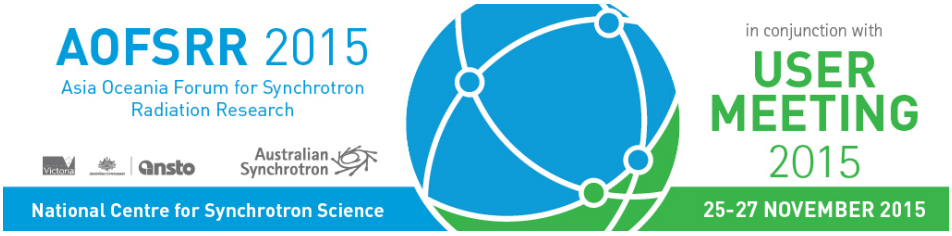

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Mid-infrared and far-infrared synchrotron sourced spectroscopy of Titan's cyanide haze

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Saturn's largest moon Titan has a chemically diverse atmosphere, an icy surface and is the only other planetary-body with comparable molecular complexity to Earth. Thus, analysis of Titan's atmosphere can give new insight towards prebiotic Earth chemistry.
In Titan's atmosphere, ongoing photolytic and radiolytic interactions with N2 and CH4 precursor molecules yield a suite of nitrile species. Polymeric nitriles (tholins) condense and form suspended aerosols which contribute to the distinctive orange haze of Titan's atmosphere. These unidentified species are seasonally reactive as seen via suspected aerosol far-infrared absorption bands at 220cm-1. However, to complicate assigning these features, there have been no infrared analyses on the morphology of nitrile aerosols under Titan conditions. Researchers have also not yet determined the importance of temperature, pressure and particle size on the spectra of pure nitrile aerosols over IR wavelengths. Yet without such an understanding, the fundamental morphology of nitrile aerosols will remain unresolved and the unidentified emission features of Titan's stratosphere cannot be identified. In this talk we present mid-infrared and far-infrared studies of select nitrile aerosols under conditions replicating the Titan atmosphere. The laboratory study was completed at the Australian Synchrotron Terahertz/Far-Infrared beamline using a specialised enclosive flow cooling cell to generate nitrile aerosols. Our research provides the astrochemistry community complete infrared signatures of pure nitrile aerosols in mid-infrared and far-infrared over a range of astrochemical conditions.

Keywords

infrared titan aerosol tholin prebiotic atmosphere nitrile haze cyanide

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