

## Infrared Spectra and Optical Constants of Nitrile Ices Relevant to Titan's Atmosphere

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### ABSTRACT

Spectra and optical constants of nitrile ices known or suspected to be in Titan's atmosphere have been determined from 2.0 to 333.3 microns ( $\sim 5000$  to  $30\text{ cm}^{-1}$ ). These results are relevant to the ongoing modeling of Cassini CIRS observations of Titan's winter pole. Ices studied were: HCN, hydrogen cyanide;  $\text{C}_2\text{N}_2$ , cyanogen;  $\text{CH}_3\text{CN}$ , acetonitrile;  $\text{C}_2\text{H}_5\text{CN}$ , propionitrile; and  $\text{HC}_3\text{N}$ , cyanoacetylene. Optical constants were calculated, using Kramers-Kronig analysis, for each nitrile ice's spectrum measured at a variety of temperatures, in both the amorphous- and crystalline phases. Spectra were also measured for many of the nitriles after quenching at the annealing temperature and compared with those of annealed ices. For each of these molecules we also measured the real component,  $n$ , of the refractive index for amorphous and crystalline phases at 670 nm. Several examples of the information contained in these new data sets and their usefulness in modeling Titan's observed features will be presented (e.g., the broad emission feature at  $160\text{ cm}^{-1}$ ; Anderson and Samuelson, 2011).