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

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\textbf{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 (~5000 to 30 cm\textsuperscript{-1}). These results are relevant to the
ongoing modeling of Cassini CIRS observations of Titan’s winter pole. Ices studied were:
HCN, hydrogen cyanide; C\textsubscript{2}N\textsubscript{2}, cyanogen; CH\textsubscript{3}CN, acetonitrile; C\textsubscript{2}H\textsubscript{5}CN, propionitrile; and
HC\textsubscript{3}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 cm\textsuperscript{-1}; Anderson and Samuelson, 2011).