

Temperature Dependence for the Relative Raman Cross Section of the Ammonia/Water Complex

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The Raman spectra of aqueous ammonia solutions have been obtained between -40° and 25°C . The Raman spectrum of neat water was also obtained at 25°C and is characterized by two broad peaks observed at 3200 and 3400 cm^{-1} . The spectrum due to water is subtracted to determine the NH_3 spectrum at all temperatures. In ammonia-water solutions, the spectrum shows three features at measured displacements of 3250 , 3316 , and 3400 cm^{-1} . The feature at 3316 cm^{-1} is assigned to the Q branch of the symmetric stretch. The broad, weak features at 3250 and 3400 cm^{-1} , previously assigned to rotational bands, are assigned to combination band. The NH_3 combination bands are assigned by comparing with sum frequency generation (SFG) experiments, monitoring changes with temperature, and analyzing the polarization data. The rotational structure of the Q band is also discussed. As the temperature is lowered from 25 to -40°C , an increase in the Raman intensity is observed for all bands. The relative Raman scattering cross section is determined from the numerically integrated area of the NH_3 Q branch at each temperature.