

Ammonia-Water Complexes on the Surface of Aqueous Solutions Observed with Sum Frequency Generation

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Sum frequency generation (SFG) is used to obtain the vibrational spectrum of aqueous ammonia solutions at the liquid/vapor interface. The sum frequency spectrum of concentrated x (x = mole fraction) NH_3 , is dominated by the N-H symmetric stretch (ν_1) at 3312 cm^{-1} and a weaker deformation mode ($2\nu_4$) at about 3200 cm^{-1} . The free OH peak of water in this mixture is suppressed, compared to pure water, and the hydrogen-bonded region ($3000 - 3450 \text{ cm}^{-1}$) has interference in the presence of ammonia molecules at the interface. In dilute solutions of $0.14 x \text{ NH}_3$, ν_1 is less intense and the free OH peak of water appears. These observations confirm the existence of an ammonia-water complex at the liquid/vapor interface.