THE INVERSION MOTION IN THE Ne - NH_3 VAN DER WAALS DIMER STUDIED VIA MICROWAVE SPECTROSCOPY

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The umbrella inversion motion of the ammonia molecule leads to a tunneling splitting of the ammonia energy levels. Transitions between rotational energy levels in different tunneling states lie in the microwave region and can be studied using a Fourier transform microwave spectrometer. Our study of Ne - NH_3 investigates the effect of the neon atom on the NH_3 inversion motion. Twelve transitions in total have been measured for the inversion motion in ^{20}Ne - $^{14}NH_3$ (and several minor isotopomers: ^{22}Ne - $^{14}NH_3$, ^{20}Ne - $^{15}NH_3$, ^{22}Ne - $^{15}NH_3$). The gas sample contained 0.3% NH_3 in 4-5 atm of Ne. Due to isotope enrichment of ^{22}Ne (9.25% naturally abundant) in the molecular expansion, the ^{22}Ne - NH_3 signals had similar intensities to the ^{20}Ne - NH_3 signals. To distinguish the isotopomers, an enriched sample of 3% ^{20}Ne (99.95%, Cambridge Isotopes) with 0.3% NH_3 in a helium backing gas was used. The results from this enriched sample study show an anomalous isotope effect where the inversion transitions of the heavier ^{22}Ne isotopomers are observed at higher frequencies. This isotope effect is not observed with the Ne - $^{15}NH_3$ isotopomers, whose inversion transitions were measured at lower frequencies than the analogous Ne - $^{14}NH_3$ dimers.

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