

# JET-COOLED INFRARED LASER SPECTROSCOPY IN THE UMBRELLA $\nu_2$ VIBRATION REGION OF $\text{NH}_3$ : IMPROVING THE POTENTIAL ENERGY SURFACE MODEL OF THE $\text{NH}_3 - \text{Ar}$ VAN DER WAALS COMPLEX

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Taking advantage of our sensitive laser spectrometer coupled to a pulsed slit jet<sup>b</sup> we recorded near the  $\nu_2$  vibration a series of rovibrational transitions of the  $\text{NH}_3 - \text{Ar}$  van der Waals (vdW) complex. These transitions involve in the ground vibrational state several internal rotor states corresponding to the ortho $\text{NH}_3$  and para $\text{NH}_3$  spin modifications of the complex. They are labeled by  $\Sigma_a(j,k)$ ,  $\Sigma_s(j,k)$ ,  $\Pi_a(j,k)$  and  $\Pi_s(j,k)$  where  $\Sigma(K=0)$  and  $\Pi(K=1)$  indicate the projection  $K$  of the total rotational angular momentum  $J$  on the vdW axis, the superscripts  $s$  and  $a$  designate a symmetric or antisymmetric  $\text{NH}_3$  inversion wave function, and  $j$ ,  $k$  quantum numbers indicate the correlation between the internal-rotor state of the complex and the  $j$ ,  $k$  rotational state of the free  $\text{NH}_3$  monomer. Five bands have been identified, only one of which was partly observed before<sup>c</sup>. They include transitions starting from the  $\Sigma_a(j=0 \text{ or } j=1)$  state without any internal angular momentum, consequently they can be assigned from the band contour of a linear-molecule-like  $K=0$ ,  $\Delta J=1$  transition. The energies and splittings of the rovibrational levels of the  $\nu_2 = 1 \leftarrow 0$  spectrum derived from the analysis of the  $\Pi_s$ ,  $\Sigma_s(j=1) \leftarrow \Sigma_a(j=0)$ ,  $k=0$  bands and mostly of the  $\Sigma_s$ ,  $\Pi_s$  and  $\Sigma_a(j=1) \leftarrow \Sigma_a(j=1)$ ,  $k=1$  bands bring relevant information about the  $\nu_2$  dependence of the  $\text{NH}_3 - \text{Ar}$  interaction, the rovibrational dynamics of the  $\text{NH}_3 - \text{Ar}$  complex and provide a sensitive test of a recently developed 4D potential energy surface that includes explicitly its dependence on the umbrella motion<sup>d</sup>.

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