P152a High NH_2D/NH_3 ratios around the low-mass protobinary NGC1333 IRAS4A

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Investigating molecular isotopic ratios such as D/H ratios around low-mass protostars is essential to understand the chemical origin of our Solar system. In the hot ($\gtrsim$100 K) region around protostars, major volatiles such as H_2O, CH_3OH, and NH_3 have sublimated from the dust grain surface to the gas phase, allowing us to constrain its abundance or isotopic ratio with radio molecular line observations. We observed multiple NH_3 and NH_2D transitions toward the protobinary system NGC1333 IRAS4A (4A1 and 4A2) with Karl G. Jansky Very Large Array (VLA) at a high angular resolution ($\sim$1" or $\sim$300 au). We detected NH_3 high excitation lines toward both of the binary, indicating the hot NH_3 gas in the vicinity of the protostars. Two NH_2D high excitation lines are also tentatively detected. Employing the local thermodynamical equilibrium (LTE) analysis, we found remarkably high NH_2D/NH_3 ratios of $\sim$0.9 and $\sim$0.5 with excitation temperatures of $\sim$90 K and $\sim$150 K for 4A1 and 4A2, respectively. Such high NH_2D/NH_3 ratios may indicate relatively late formation of NH_3 ices in the parental molecular cloud, or spatially unresolved physical and/or chemical structures as also hinted by the narrower line widths of NH_2D lines. The higher NH_2D/NH_3 ratio and lower excitation temperature in 4A1 may be explained as follows; only the outer surface of layered ices, which has a higher molecular D/H ratio, have sublimated in 4A1 due to its lower temperature, while ices have fully sublimated in 4A2.