MAGNETIC TRAPPING OF $^3\Sigma$ MOLECULES AND TIME-DOMAIN MEASUREMENT OF VIBRATIONAL LIFETIMES

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NH molecular radicals are magnetically trapped using helium buffer-gas loading at ∼600 mK. The helium collision Zeeman relaxation and energy transport cross sections are measured, and the ratio of these cross sections is $\sigma_{\rm d}/\sigma_{\rm in} = 7 \times 10^4$, sufficient for trap lifetimes of order 1 s. The scaling of the helium-induced Zeeman relaxation of $^3\Sigma$ molecules is investigated by changing the radical rotational constant through isotopic substitution. We also measure the spontaneous emission lifetime of NH(X, $v = 1$), providing a precision measurement of this transition strength for the astrophysical community.