ON THE IONIZATION DYNAMICS OF YTTERBIUM MONOFLUORIDE (YbF)

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The ytterbium monofluoride molecule has gained significant attention as a system well-suited for measuring the electric dipole moment of the electron. Here we present resonance enhanced multi-photon ionization (REMPI) spectra with excitation via the $A^2\Pi_{1/2}$ state of YbF, containing a multitude of the molecule's Rydberg states ($n \geq 24$) in the energy range of $48500 - 48750$ cm^{-1}. The measurements are performed on a pulsed YbF molecular beam produced by laser ablation and subsequently cooled by supersonic expansion. We have assigned the measured Rydberg states to series converging to several rotational levels ($N^+ = 0 - 11$) of the non-vibrationally excited ($\nu^+ = 0$) ground state of the YbF^+ ion. This assignment leads to accurate values for the ionization energy (IE) of YbF and the rotational constant B^+ of YbF^+. In addition, we have performed rotationally resolved measurements over the same energy range via the higher-lying [31.05] excited electronic state, and compared the spectra to the ones obtained via A state excitation. We attribute the observed differences in ionization behavior between the two excitation schemes to the hybrid character of the [31.05] state, i.e. to this state stemming from both the usual $Yb^+[4f^{14}6s^1]$ configuration, as well as the inner-shell excited $Yb^+[4f^{13}6s^2]$ one.