SPECTROSCOPY OF THE LOW-ENERGY STATES OF BaO^+

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The BaO^+ cation is a promising candidate for studies conducted at ultra-cold temperatures. It is known that the ion can be formed by the reaction of laser-cooled Ba^+ with N_2O or O_2. Spectroscopic data are now needed for the BaO^+ cation, for both characterization of the internal state population distributions and the design of population transfer schemes. We have obtained the first spectroscopic data for BaO^+ using the pulsed-field ionization, zero kinetic energy (PFI-ZEKE) photoelectron technique. Two-color ionization was carried out via the $A^1\Sigma^+$-$X^1\Sigma^+$ transition of BaO. Vibronic levels of the $X^2\Sigma^+$, $A^2\Pi_{3/2}$ and $A^2\Pi_{1/2}$ states of BaO^+ have been characterized. The results are compared with the predictions of high-level electronic structure calculations.