VIBRATIONAL AND GEOMETRIC STRUCTURES OF La_3C_2O AND $La_3C_2O^+$ FROM MASSE-ANALYZED THRESHOLD IONIZATION

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La_3C_2O is produced for the first time by laser vaporization in a pulsed cluster source and identified by photoionization time-of-flight mass spectrometry. Vibrationally-resolved ion spectra are obtained with mass-analyzed threshold ionization (MATI) spectroscopy. The adiabatic ionization energy of La_3C_2O is measured to be 30891(5) cm^{-1}. The spectra display several short vibrational progressions, and these progressions are associated mainly with La-La, La-C and La_3C_2O stretching excitations. The electron-spin multiplicities and molecular symmetries of La_3C_2O and $La_3C_2O^+$ are determined by combining the experimental measurements with ab initio calculations at MP2 level. Preliminary data analysis shows that the $^1A_1 \leftarrow {}^2A_1$ transition is responsible for the observed MATI spectra. The cluster has C_{2v} symmetry with La_3C_2O in a bi-pyramid structure and oxygen being attached to the La_3 plane.