VIBRONIC SPECTROSCOPY OF JET-COOLED 2-FLUORO-m-XYLYL AND 2-CHLORO-m-XYLYL RADICALS GENERATED BY CORONA DISCHARGE

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By means of a technique of corona excited supersonic expansion (CESE) combined with a pinhole-type glass nozzle developed in this laboratory, we generated vibronically excited but jet-cooled 2-fluoro-m-xylyl and 2-chloro-m-xylyl radicals from precursors 2-fluoro-m-xylene 2-chloro-m-xylene with a large amount of carrier gas He, respectively. The well-resolved vibronic emission spectra of the jet-cooled radical species were recorded with a long-path monochromator in the visible region. From the analysis of the spectrum, we determine an accurate electronic energy of the $D_1 \rightarrow D_0$ transition and the frequencies of vibrational modes in the ground electronic state by comparison with those of $ab\ initio$ calculations and the known spectroscopic data of precursors for the first time. The red-shift of the origin band of each species from parental benzyl radical agrees well with those predicted from synergic effect of each substituent into benzene ring.