SPECTROSCOPIC IDENTIFICATION OF ISOMERIC TRIMETHYLBENZYL RADICALS GENERATED IN CORONA DISCHARGE OF TETRAMETHYLBENZENE

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The visible vibronic emission spectra were recorded from the corona discharge of precursor tetramethylbenzene with a large amount of inert carrier gas helium using a pinhole-type glass nozzle coupled with corona excited supersonic expansion (CESE) well developed in this laboratory. The spectra showed a series of vibronic bands in the $D_1 \rightarrow D_0$ electronic transition of jet-cooled benzyl-type radicals formed from the precursor in a corona excitation. The analysis confirmed that two isomeric radicals, 2,3,4- and 2,3,6-trimethylbenzyl radicals and three isomeric radicals, 3,4,5-, 2,3,5- and 2,4,6-trimethylbenzyl radicals were produced, respectively, from 1,2,3,4- and 1,2,3,5-tetramethylbenzenes as a result of removal of a hydrogen atom from the methyl group at different substitution position. For each isomeric trimethylbenzyl radical generated in the corona discharge of precursor, the electronic transition and a few vibrational mode frequencies were determined in the ground electronic state by comparing with those from both *ab initio* calculations and the known vibrational data of the precursor. The substitution effect that states the shift of electronic transition depends on the nature, the number, and the position of substituents on the ring has been qualitatively proved for the case of benzyl-type radicals.