

Laboratory Spectroscopy of Phenoxy Radical as a Candidate of Interstellar Matter

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The electronic transition of the phenoxy radical C_6H_5O produced in a discharge of anisole was measured by using a cavity ringdown (CRD) spectrometer.

Diffuse Interstellar Bands (DIBs) are optical absorption lines observed in diffuse clouds in interstellar space. They still remain the longest standing unsolved problem in spectroscopy and astrochemistry, although several hundreds of DIBs have been already detected. It is expected that identifications of DIBs can give us crucial information for extraterrestrial organic molecules. One of the best approaches to identify carrier molecules of DIBs is measurements of DIB candidate molecules produced in the laboratory to compare their absorption spectra with astronomically observed DIB spectra.

Aromatic radicals in a gas phase are potential DIB candidate molecules. The electronic transitions of aromatic radicals result in optical absorption. However, because the radicals are unstable, their electronic transitions are difficult to observe using a laboratory spectrometer system. To solve this difficulty, we have utilized a glow-discharge cell using a hollow cathode in which the radicals can be effectively produced as a high-density plasma.

The radicals produced in a discharge of anisole were measured by using CRD spectrometer, which is an apparatus to observe an high-resolution optical absorption spectrum. The bands observed in the 570 — 630 nm region in the discharge were assigned to the electronic transition of the phenoxy radical C_6H_5O on the basis of the reported low resolution spectra. Comparison studies of the phenoxy radical were made with known DIB spectra.

Keywords: Diffuse Interstellar Bands, interstellar molecule, cavity ring down, spectroscopy, molecular cloud, discharge