

# Laboratory Detection of New Absorption Bands of Interstellar-Molecule Candidate Thiophenoxy Radical

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Diffuse Interstellar Bands (DIBs) are absorption bands detected in diffuse clouds by optical observations. Although ~600 DIBs have been found so far, only the five bands were assigned to the fullerene cation and the other bands are not identified yet. Recently, benzonitrile ( $C_6H_5CN$ ) was detected in interstellar space by radio as the first aromatic compound [1]. Thus, thiophenoxy radical ( $C_6H_5S$ ) is received much attentions as a candidate of DIBs, because sulfur is a dominant element of interstellar molecules. For this molecule, the origin band, which is a pure electronic transition without effects of molecular vibrations, was observed as the strongest band of the  ${}^2A_2-X^2B_1$  electronic transition [2,3]. However, our previous measurement of phenoxy radical ( $C_6H_5O$ ) showed the strong vibronic bands with effects of molecular vibrations [4]. Thus, strong vibronic bands of  $C_6H_5S$  are expected because of similarity of the two molecules. We investigated the vibronic bands in the 473 –519 nm region by Cavity Ring Down spectroscopy and detected them. The strongest vibronic band at 4850 Å was assigned to the  $6a_0^2 + 6b_0^1$  transition. This band is thought to be a candidate of DIB.

[1] McGuire *et al.* *Science*, **359**, 202 (2018). [2] Shibuya *et al.*, *J. Chem. Phys.* **121**, 237 (1988). [3] Araki *et al.*, *Astronomical J.* **148**, 87 (2014). [4] Araki *et al.*, *Astronomical J.* **150**, 113 (2015).

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