A line survey of the massive star-forming region Sgr B2(M) in the 3 and 7 mm regions

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Line survey is an intensive investigation of chemical composition of a molecular cloud. The galactic center region is still primitive for detail chemical composition. In the present study, we carried out line survey of the massive star-forming region Sgr B2(M) in the 3 and 7 mm regions with Nobeyama 45 m radio telescope. Especially the 7 mm region was firstly surveyed in this cloud. Fig. 1 shows the observed peaks in the 3 and 7 mm regions. The $J = 7_{16} - 6_{15}$ and $7_{25} - 6_{24}$ transitions of HCOOCH$_3$ were observed for the first time in Sgr B2(M). The column density was determined to be $9.3 \times 10^{13}$ cm$^{-2}$, where the rotational temperature was fixed at 23 K reported by Cummins et al [1]. The lines of the $J = 6 - 5$ transition for CH$_3$CCH were also observed. The column density and the rotational temperature were determined to be $1.1 \times 10^{16}$ cm$^{-2}$ and 38 K, respectively. In addition, the lines of CH$_3^{13}$CCH were observed for the first time as an interstellar molecule. In the 7 mm region, the absorption lines of the $J = 1 - 0$ transition were observed for $^{28}$SiO and $^{29}$SiO. Although both the components of the envelop of Sgr B2(M) and the clouds in front of it were found for $^{28}$SiO, the former was only detected for $^{29}$SiO. This difference is thought to be due to a higher $^{29}$Si/$^{28}$Si ratio in Sgr B2(M).

Fig. 1: The observed peaks in the 3 mm and 7 mm regions with Nobeyama radio telescope. Upper panel: 87.5–91.5 GHz. Middle panel: 99.6–103.6 GHz. Lower panel: 42.5–45.5 GHz.