P140c Spectral-line survey toward an outflow-shocked region, OMC2-FIR 4

Yoshito Shimajiri (CEA), T. Sakai (The Univ. of Electro-Communications), Y. Kitamura (JAXA), M. Saito, F. Nakamura, R. Kawabe (NAOJ), T. Tsukagoshi, M. Momose (Ibaraki Univ.), S. Takakuwa (ASIAA), T. Yamaguchi, N. Sakai, and S. Yamamoto (Univ. of Tokyo)

We performed the first spectral-line survey at 82-106 GHz and 335-355 GHz toward the outflow-shocked region, OMC2-FIR 4, the outflow driving source, FIR 3, and the northern outflow lobe, FIR 3N. We detected 120 lines. The line profiles are found to be classifiable into two types: one is a single Gaussian component with a narrow (<3 km/s) width and another is two Gaussian components with narrow and wide (>3 km/s) widths. The narrow components for the most of the lines are detected at all positions, suggesting that they trace the ambient dense gas. For CO, CS, HCN, and HCO^+, the wide components are detected at all positions, suggesting the outflow origin. The wide components of $C^{34}S$, SO, SiO, $H^{13}CN$, $HC^{15}N$, $H_2^{13}CO$, H_2CS, HC_3N, and CH_3OH are detected only at FIR 4, suggesting the outflow-shocked gas origin. The rotation diagram analysis revealed that the narrow components of C_2H and $H^{13}CO^+$ show low temperatures of $\sim$12.5 K, while the wide components show high temperatures of 20-70 K. This supports our interpretation that the wide components trace the outflow and/or outflow-shocked gas. We compared observed molecular abundances relative to $H^{13}CO^+$ with those of the outflow-shocked region, L1157 B1, and the hot corino, IRAS 16293-2422. Although we cannot exclude a possibility that the chemical enrichment in FIR 4 is caused by the hot core chemistry, the chemical compositions in FIR 4 are more similar to those in L1157 B1 than those in IRAS 16293-2422.