TESTING DUST-SURFACE FORMATION MODEL OF PREBIOTIC MOLECULE CH_3NCO IN STAR-FORMING CORE SAGITTARIUS B2(N1) BY ALMA

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Origin of organic molecules on Earth is discussed to be interstellar clouds, because comets carried molecules produced in clouds. Methyl isocyanate CH_3NCO is presumably one of the delivered organic molecules at the primitive earth. However, observed abundance ratios of [CH_3NCO]/[HNCO] in molecular clouds [1] are clearly lower than that in the comet 67P [2]. Recently a theoretical study has suggested that this abundance anomaly can be explained by a model of dust-surface formation of CH_3NCO in molecular clouds [3]. If that is the case, high-temperature CH_3NCO desorbed from dust surface makes a compact distribution in a central region of a star-forming core. To examine this temperature and distribution condition, the spatial and spectral data of CH_3NCO toward the (N1) core of the star-forming region Sagittarius B2 observed by ALMA were investigated in the 94–113 GHz region for 24 rotational lines. Considering intensity maps and velocity structures, a compact distribution relating to a bipolar molecular flow and an accretion disk already suggested [4] was imaged by CH_3NCO. Rotational temperatures are 20–60 K and column densities are 10^{15} cm^{-2}. These results suggest hot and dense conditions of this molecule in the central region of the core. Hence, CH_3NCO detected in the present data is likely to be produced on dust surface. The model explaining the abundance anomaly is observationally supported.
[1] Halfen et al., 2015, ApJL, 812, L5. [2] Goesmann et al., 2015, Sci., 349, 6247. [3] Majumdar et al., 2018, MNRAS, 473, L59. [4] Lis et al. 1993, ApJ, 402, 238.