

P124a ALMA observations of CH₃OH and HC₃N toward three low-mass young stellar objects in the Perseus region

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Both CH₃OH and HC₃N are representative species of interstellar complex organic molecules (iCOMs) and carbon-chain species, respectively, and they are prevalent in star-forming regions. We have analyzed ALMA cycle 5 data in band 4 toward three low-mass young stellar objects (IRAS03235, IRAS03245, and IRAS03271) in the Perseus region. The HC₃N ($J = 16 - 15$) line has been detected from all of the three sources, while four CH₃OH lines in the 157 GHz band have been detected only from IRAS03245. We derived column densities and excitation temperatures of HC₃N and CH₃OH with the MCMC method in the CASSIS software, and obtained the CH₃OH/HC₃N abundance ratio. The observed CH₃OH/HC₃N ratio in IRAS03245 (3.7 ± 0.6) is reproduced by results of our chemical network simulations at dust temperatures of ≈ 32 K, which agrees with the observed dust temperature (37 ± 2 K). All of the target sources have similar envelope masses, but the bolometric luminosity in IRAS03245 is higher than the others. Thus, the non-thermal desorption mechanism of CH₃OH is likely important for the gas-phase CH₃OH production around low-mass YSOs.