P140a Physics and Chemistry of a Low-Metallicity Hot Molecular Core in the LMC

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Understanding properties of interstellar molecules at low metallicity is crucial to unveil chemical processes in the past interstellar environments, where the metallicity was significantly lower than in the present-day solar neighborhood. Hot molecular cores are one of the early stages of star formation and they play a key role in the chemical processing of interstellar molecules, especially for complex species. Here we present the results of 0.1 pc-scale observations with ALMA in 250 GHz and 350 GHz towards a newly-discovered hot molecular core in a nearby low-metallicity galaxy, the Large Magellanic Cloud (LMC). Molecular lines of CH_3OH, H_2CO, CCH, $H^{13}CO^+$, CS, $C^{34}S$, $C^{33}S$, SO, ^{34}SO, ^{33}SO, SO_2, $^{34}SO_2$, $^{33}SO_2$, OCS, H_2CS, CN, NO, HNCO, $H^{13}CN$, CH_3CN, and SiO are detected from the high-mass young stellar object, ST16. Molecular line distributions and excitation analyses suggest that these molecules distribute in different regions around a protostar; hot core, cold envelope, outflow cavity, and dense clump. Molecular abundances of the ST16 hot core are compared with those of other LMC's and Galactic hot cores. We found that SO_2 would be a useful molecular tracer for low-metallicity hot core chemistry, because it shows similar abundances within LMC hot cores and the typical abundance roughly scale with the LMC's metallicity. This is remarkably in contrast to the classical hot core tracer, CH_3OH, and other organic molecules, which show a large abundance variation in low-metallicity hot cores.