P109a First detection of an extragalactic hot molecular core with ALMA

下西隆 (東北大学), 尾中敬 (東京大学), 河村晶子 (国立天文台), 相川祐理 (筑波大学)

We report the first detection of a hot molecular core outside our Galaxy based on submillimeter observations with ALMA toward a high-mass young stellar object (YSO) in a nearby low metallicity galaxy, the Large Magellanic Cloud (LMC) (Shimonishi et al. 2016, ApJ, in press, arXiv:1606.02823). Molecular emission lines of CO, $C^{17}O$, HCO^+, $H^{13}CO^+$, H_2CO, NO, SiO, H_2CS, ^{33}SO, $^{32}SO_2$, $^{34}SO_2$, and $^{33}SO_2$ are detected from a compact region ($\sim$0.1 pc) associated with a high-mass YSO, ST11. The temperature of molecular gas is estimated to be higher than 100 K based on rotation diagram analysis of SO_2 and $^{34}SO_2$ lines. The compact source size, warm gas temperature, high density, and rich molecular lines around a high-mass protostar suggest that ST11 is associated with a hot molecular core. We find that the molecular abundances of the LMC hot core are significantly different from those of Galactic hot cores. The abundances of CH_3OH, H_2CO, and HNCO are remarkably lower compared with Galactic hot cores by at least 1–3 orders of magnitude. We suggest that these abundances are characterized by the deficiency of molecules whose formation requires the hydrogenation of CO on grain surfaces. In contrast, NO shows a higher abundance in ST11 than in Galactic sources despite the notably low abundance of nitrogen in the LMC. A multitude of SO_2 and its isotopologue line detections in ST11 imply that SO_2 can be a key molecular tracer of hot core chemistry in metal-poor environments. In this presentation, we discuss physical and chemical characteristics of a hot molecular core in the low metallicity galaxy.