P134a Chemical and Physical Characterization of the Isolated Source CB68

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We report chemical and physical structures of the low-mass Class 0 protostellar source IRAS 16544−1604 in the Bok globule CB68 (L146). The result is based on the ALMA observation in the 1.2 and 1.3 mm bands at a linear spatial resolution of 70−80 au conducted as the large program FAUST.

Three interstellar saturated complex organic molecules (iCOMs) CH_3OH, $HCOOCH_3$, and CH_3OCH_3 are detected. They are concentrated around the protostar and not spatially resolved. The rotation temperature of CH_3OH is derived to be 131 ± 11 K with the beam filling factor of 0.022 ± 0.003. The small beam filling factor means that the emitting region is as small as 10 au. The detection of iCOMs in such a hot region in the vicinity of the protostar indicates that CB68 harbors a hot corino. The abundance ratios between iCOMs are similar to those found in hot corinos. In addition, extended emission lines of carbon-chain molecules associated with the protostar are detected, revealing warm carbon chain chemistry on a scale of 10^3 au. These features indicate the hybrid chemical character, as reported for L483 and B335. The kinematic structure of the $C^{18}O$, CH_3OH, and OCS lines is explained by the infalling-rotating envelope model, and the protostellar mass and the radius of the centrifugal barrier are estimated to be $0.15^{+0.15}_{-0.07}$ $M_\odot$ and <30 au, respectively. The small radius of the centrifugal barrier seems consistent with the small emitting region of iCOMs.