P54a Detection of HCO_2^+ toward the Low-Mass Protostar IRAS 04368+2557 in L1527

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The millimeter-wave rotational emission lines ($4_{04}-3_{03}$ and $5_{05}-4_{04}$) of protonated carbon dioxide, HCO_2^+($HOCO^+$), has been detected toward the low-mass class 0 protostar IRAS04368+2557 in L1527 with the IRAM 30 m telescope. This is the first detection of HCO_2^+ except for the Galactic Center clouds. The column density of HCO_2^+ averaged over the beam size ($29''$) is determined to be 5.8×10^{10} cm^{-2}, assuming the rotational temperature of 12.3 K. The fractional abundance of gaseous CO_2 relative to H_2 is estimated from the column density of HCO_2^+ with an aid of a simplified chemical model. If the HCO_2^+ emission only comes from the evaporation region of CO_2 near the protostar ($T > 50$ K), the fractional abundance of CO_2 is estimated to be higher than 4×10^{-4}. This is almost close to the elemental abundance of carbon in interstellar clouds, and hence, the direct evapolation of CO_2 fro! m dust grain is unrealistic as a source of gaseous CO_2 in L1527. A narrow line width of HCO_2^+ also supports this. On the other hand, the fractional abundance of CO_2 is an order of 10^{-7}, if the source size is comparable to the beam size. These results indicate that gaseous CO_2 is abundant even in the low-mass star-forming region. Possible production mechanisms of gaseous CO_2 are discussed.