

50 au-scale Chemical Composition of R CrA IRS7B-a: FAUST

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The diversity of chemical compositions among Solar-like protostars has been recognized by recent high angular resolution and high sensitivity observations of ALMA. R CrA IRS7B is a low-mass protostar in the Class 0/I stage in Corona Australis ($d = 152$ pc: Galli et al. 2020). The protostar is thought to be strongly irradiated by a Herbig Ae star R CrA at a distance of about 4000 au from IRS7B-a. In fact, the temperature of extended molecular gas component around the protostar is estimated to be about 50 K, which is higher than that of typical dense molecular clouds, by H₂CO observation with APEX and SMA (Lindberg et al. 2012). Moreover, CCH and CN, which are characteristic molecular species in the photodissociation region, are strongly detected at the protostar position by spectral line survey observations ASTE and APEX telescopes (Watanabe et al. 2012, Lindberg et al. 2014).

We have observed the protostar IRS7B at a scale of 50 au, as one of 13 target sources of ALMA large program FAUST (Fifty AU Study of the chemistry in the disk/envelope system of solar-like protostars). The ALMA observation detected two continuum sources as Ohashi et al. (2023) reported. SO and C¹⁸O are associated with the strongest continuum peak IRS7B-a and show a rotation motion of a Keplerian disk. On the other hand, the emission lines of CH₃OH and CS are weakly detected and no complex organic molecules (COMs) found in Hot Corinos are detected at IRS7B-a. One possible origin of the deficiency of COMs is that the formation of COMs is suppressed due to inefficient adsorption of molecules under the high-temperature environment by strong UV radiation during the starless phase. Moreover, we found that carbon-bearing sulfur molecules, such as CS, H₂CS, and OCS are deficient in IRS7B-a compared with a typical Hot Corino source IRAS 16293-2422 while the abundance of SO₂ relative to SO is similar to each other. In this poster, we will discuss the chemical characteristics in this source at a scale of 50 au.

References

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