

ALMA Observations of the Spatial Distribution of three C₂H₄O₂ Isomers towards Sgr B2(N)

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The C₂H₄O₂ isomeric triplet found in the interstellar medium consists of glycolaldehyde (CH₂OHCHO), acetic acid (CH₃COOH), and methyl formate (HCOOCH₃), the mechanisms of synthesis of which may involve both gas-phase and grain-surface processes [1]. Using the ALMA Band 3 observations [2], we report the discovery of previously undetected transitions of the C₂H₄O₂ isomers with the high spatial-resolution sub-millimeter maps of CH₂OHCHO, CH₃COOH, and HCOOCH₃. HCOOCH₃ and CH₂OHCHO each display two different velocity components at 64 km s⁻¹ and 73 km s⁻¹ respectively, while only one velocity component of CH₃COOH at 64 km s⁻¹ is resolved. Moreover, the distribution of HCOOCH₃ is extended and offset from the continuum emission, unlike CH₂OHCHO and CH₃COOH, of which the low-velocity component we find to be concentrated toward the continuum emission peak of Sgr B2(N). The difference in the morphology of the three isomers indicates that the three isomers might have different formation mechanisms.

References

- [1] J. M. Hollis, F. J. Lovas & P. R. Jewell, 2000, ApJ, 540, L107
- [2] A. Belloche, H. S. P. Müller, R. T. Garrod, & K. M. Menten, 2016, A&A, 587, A91