

Complex organic molecules in star- and planet-forming regions

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Complex organic molecules (COMs) are intensively searched for around solar-mass protostars in recent years. For example, glycolaldehyde (HCOCH_2OH), the simplest sugar, was detected around IRAS16293 in the ALMA Science Verification program (Jorgensen et al. 2012). COMs are expected to be more abundant in ice mantles than in the gas phase, because their sublimation temperature is relatively high, and because grain-surface reactions would play significant roles in their formation. COMs in star-forming regions, especially in ice mantle, could be an important reservoir of organic compounds in the planetary-system formation and/or mother molecules of prebiotic molecules. It is, however, very difficult to directly observe COMs in ice mantle. Combination of line observations (of gaseous COMs) and theoretical modeling of gas-grain chemistry is thus needed to understand the formation and destruction of COMs in the gas phase and ice mantle. Computational modeling efforts include (i) radiation hydrodynamics of star formation, (ii) gas-grain chemical network calculations and (iii) physical/chemical calculations to determine the rates and efficiencies of various chemical reactions and micro processes. In this contribution, I will review recent progresses, especially in (ii) and (iii).

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