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Chemical Diversity and Evolution toward Protoplanetary Disks

Friday 18 October 2019 09:00 (25 minutes)

Invited talk

Abstract:
Star and planet formation is one of the most fundamental structure-formation processes in the Universe. Physical processes of star and planet formation have widely been investigated as one of the major targets of observational astronomy and astrophysics during the last few decades. Meanwhile, star and planet formation is inevitably accompanied with the evolution of interstellar matter. Increasing sensitivity of various telescopes allows us to identify about 200 interstellar molecules so far. This indicates high chemical complexity of interstellar clouds despite their extreme physical condition of low temperature (10-100 K) and low density (102-107 cm-3), which would ultimately be related to an origin of rich substances in the Solar System.
In the last two decades, it is clearly demonstrated that envelopes as well as protostellar disks around solar-type protostars have significant chemical diversity: some sources harbor various saturated- “complex-” organic molecules (COMs), whereas some others harbor unsaturated species instead. The chemical diversity would originate from different history of the physical environment, such as duration time of the starless core phase of each protostar. In fact, sources showing intermediate-type of chemistry, different type of chemical diversity have also been found. Thus, chemical evolution during formation of protoplanetary disk is one of the most important targets to be explored, because it tells us initial chemical compositions of the disks, which can be different depending on the source. Furthermore, physical processes of the disk formation will significantly affect an initial chemical composition of a protoplanetary disk. Thus, both physical and chemical approaches are indispensable. In this talk, I will summarize such efforts and will introduce recent progress of observational studies with ALMA. I will also discuss some prospects toward future studies.

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