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Organic and inorganic molecules in protostellar cores in the outer Galaxy and the Magellanic Clouds

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Nearby low-metallicity laboratories, such as the outer part of the Galaxy, as well as the Large and Small Magellanic Clouds (x0.1-0.5 solar metallicity), are excellent targets to study the star-forming "core"-scale chemical phenomena, such as the formation of complex organic molecules, in different environments. In the last decade, there has been a great progress in astrochemical studies of interstellar molecules in these sub-solar metallicity regions. We here present the results of the ALMA survey of protostellar cores in the outer Galaxy and the LMC/SMC. Chemical analyses of low-metallicity protostellar cores (especially hot cores) suggest that molecular abundances do not always simply scale with the metallicity of their parent environments. Complex organic molecules such as CH3OH show a large abundance variation within low-metallicity sources. In some LMC hot cores, CH3OH is significantly depleted beyond the level of the metallicity difference. For the outer Galaxy sources, although the sample statistics is still poor, complex organic molecules are commonly detected with the abundances that roughly scale with their metallicity. In contrast to organic molecules, inorganic molecules such as SO and SO2 are ubiquitously detected in lowmetallicity hot cores. The reason of such chemical diversity of organic molecules in low-metallicity protostellar cores remains unexplained. This presentation will summarize the recent observational progress in understanding of the chemical diversity of protostellar cores located in sub-solar metallicity environments. Preliminary results of ALMA follow-up observations with the higher spatial resolution or the wider spectral coverage toward selected sources will also be presented.

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