Infrared Observations of Methanol Ice in the Large Magellanic Cloud

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Star-/planet-formation activities can occur in various kinds of galaxies, which differ in many ways such as size, shape, and environment. Thus it is important to understand how galactic characteristics affect the properties of materials around young stellar objects (YSOs). Observations of ices and dust around extragalactic YSOs are important to understand which environment parameters are relevant to chemistry of solids in circumstellar environment. Since circumstellar materials are closely related to the interstellar medium (ISM), it is highly probable that different galactic environments (e.g., metallicity , radiation field) could affect the properties of circumstellar materials around YSOs.

The Large Magellanic Cloud (LMC) is the nearest extragalaxy to the our Galaxy and known as a low-metallicity galaxy (one-third of solar neighborhood). We have been conducting an observational study of YSOs in the LMC to understand the effect of its unique galactic environment on the properties of ices and dust around YSOs.

In this presentation, we will report the results of ground-based infrared observations of methanol ice bands toward eight embedded YSOs in the LMC with VLT/ISAAC. Methanol is an important ice mantles component and a starting point for the formation of more complex carbonaceous molecules. As a result of the observations, we could set a strong upper limit on the methanol ice abundance toward LMC's YSOs for the first time. We will discuss the effect of galactic environment on the grain surface chemistry based on the above observational results and a numerical simulation model relevant to ice chemistry.