Infrared Observations of Ices around Young Stellar Objects in the Small and Large Magellanic Cloud

Takashi Shimonishi[1], Takashi Onaka[1], Daisuke Kato[2], Itsuki Sakon[1], Yoshifusa Ita[3], Akiko Kawamura[4] and Hidehiro Kaneda[4]

[1] *Department of Astronomy, Graduate School of Science, University of Tokyo, Japan*
[2] *ISAS/JAXA, Japan*
[3] Astronomical Institute, Tohoku University, Japan
[4] *Graduate School of Science, Nagoya University*

Question of where molecules like water or carbon dioxide on the Earth's surface came from is one of the main topics of the current “astrochemistry”. One of the possible origins of these molecules is the "ices" around young stellar objects (YSOs). Observations of ices around extragalactic YSOs are one of the challenging topics in the recent ice studies. So far, infrared spectroscopic observations toward extragalactic embedded YSOs are few, and their circumstellar chemistry is still poorly understood. But it is highly probable that different galactic environments (e.g., metallicity, radiation field, etc.) could affect the properties of circumstellar material.

In this study, we first focused on YSOs in the Large Magellanic Cloud (LMC), which is the nearest metal-poor galaxy to our Galaxy. We investigated the chemical conditions of ices around high-mass YSOs in the LMC by near-infrared (2—5 micron) spectroscopic observations with the infrared satellite AKARI [1, 2]. As a result, we detected the absorption features of 3.05 micron H_2O ice, 4.27 micron CO_2 ice, and 4.67 micron CO ice toward these extragalactic YSOs. We derived column densities of these ices and showed that YSOs in the LMC have higher abundance of CO_2 ice than similar Galactic counterparts. In addition, we investigated the correlation between the chemical abundance of ices and properties of each YSO. Next, we also performed the spectroscopic observations of YSOs in the Small Magellanic Cloud, whose metallicity is much lower than the LMC, and detected the absorption features of the above major ice species [3]. .

In this study, we present the latest results of our spectroscopic observations toward extragalactic YSOs, and discuss how the chemical properties of ices depend on the galactic metallicity and YSO properties.

References

[1] T. Shimonishi, et al., ApJ, **686**, L99, (2008)
[2] T. Shimonishi, et al., A & A, 514, A12, (2010)
[3] T. Shimonishi, et al., in prep.