CONTROL ID: 2256270

TITLE: Discovery of Objects Richest in CH_3NH_2, Candidates for Future Glycine Surveys

ABSTRACT BODY:

Abstract Body: It is widely accepted that prebiotic chemical evolution from small to large and complex molecules would have resulted in the Origin of Life. If amino acids are formed in interstellar clouds, significant amount of amino acids may be delivered to planets. Thus detection of amino acids would accelerate the discussion concerning the universality of “life”.

So far, many trials to detect the simplest amino acid, glycine (NH_2CH_2COOH), were made towards Sgr B2 and other high-mass forming regions, but none of them were successful. One idea to overcome this situation would be to search for precursors to glycine. Although the chemical evolution of interstellar N-bearing COMs is poorly known, methylamine (CH_3NH_2) is proposed as one precursor to glycine. CH_3NH_2 can be formed from abundant species, CH_4 and NH_3, on icy dust surface. Further methyleneimine (CH_2NH) would be related to CH_3NH_2 (Holtom et al., 2005; Kim & Kaiser et al., 2011). Another possible route to form CH_3NH_2 is hydrogenation to HCN on dust surface : HCN → CH_2NH→ CH_3NH_2 (Theule et al., 2011).

In the past CH_2NH was reported only in Sgr B2, W51, Orion KL, and G34.3+0.15 (Dickens et al., 1997). In April 2013, we extended this survey by using the Nobeyama 45 m radio telescope towards CH_3OH-rich sources. We succeeded to detect four new CH_2NH sources. The derived fractional abundances of CH_2NH relative to H_2 are as high as $6x10^{-8}$, implying that CH_2NH may exist widely in the ISM.

If this is the case, further hydrogenation would efficiently produce CH_3NH_2. Based on this idea we conducted a survey of CH_3NH_2 towards CH_2NH-rich sources in spring of 2014, and succeeded to detect CH_3NH_2 towards two sources. The estimated fractional abundance of CH_3NH_2 to H_2 was ~ 10^{-8}, about 10 times higher than that reported towards SgrB2(N).

Since it is well known that CO_2 exists in most of molecular clouds, CH_3NH_2 could be a direct precursor candidate to glycine – the simplest amino acid— , CH_3NH_2-rich sources would turn into promising glycine targets by ALMA. Such studies would also accelerate discussion regarding the exogenous delivery of prebiotic species to planets and connection between the Universe and life.

CONTACT (NAME ONLY): Masatoshi Ohishi

CONTACT (E-MAIL ONLY): masatoshi.ohishi@nao.ac.jp

AUTHORS/INSTITUTIONS: M. Ohishi, NAOJ, Mitaka, Tokyo, JAPAN|

PRESENTATION TYPE: Oral