# Thermal stability and formation processes of membrane-like organic components

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The chemical evolution is considered to be proceeded in different environments such as interstellar medium, planetary atmosphere, primitive ocean and sea-floor hydrothermal systems and diverse steps and processes have been proposed. The formation processes of organic components in interstellar me-dium have been studied by using high energy electromagnetic radiation (ultraviolet or accelerated parti-cles), electric spark discharges, collisions. However, on the organic polymers in interstellar medium, de-spite the presence of some reports on PAHs (Polycyclic Aromatic Hydrocarbons) and graphitized carbons, little is known on their formation processes and roles in the chemical evolution to life. Therefore we have conducted in situ characterization of organic components from a carbonaceous chondrite and examined their thermal stabilities.

Hollow organic globules were identified by transmission electron microscope (TEM) observation on the newly collected Tagish Lake meteorite (Nakamura et al., 2002). Infrared (IR) microspectroscopy on these organics revealed the presence of C-H, C=O and C-O functional groups suggesting polyester-like organic membranes. Some globules include amide (CONH) bonds. These IR spectra on the organic glob-ules are similar to those on the film-like products by heating OH-bearing amino acid theronine (Thr) at around 120-160C for several days (Shiota and Nakashima, 2001). These globules in meteorites might provide a container for life as a membrane to the early Earth.

In order to study organic functional groups and their stability for these membrane-like organics, in-situ heating behavior in air of the Tagish Lake globules and the film product from Thr were investigated un-der an IR microscope equipped with a heating stage. For the Tagish Lake globules, C=O (aldehydes or ketones) disappeared at 120-160C, then C-H and COO (esters) disappeared at 320C, while amide (CONH) remained stable until 500C. On the other hand, for the film product from Thr (polyester plus smide), C-H decreased at 240-550C, while esters (COO) was stable until 350-600C and amide (CONH) remained unchanged till 600C.

We will continue these studies on Orgueil and Murchison carbonaceous chondrites and discuss formation processes and environments of these organics and together with their role in the chemical evolution to life.