

Experimental study on the relationship between evolution of stars and silicate dusts

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【 Outline of survey 】

Solid materials are formed at the early and late stages of starsevolution, The elemental abundances in the universe predict that themost abundant dust consists mainly of Mg, Si, and O, The temperatureand pressure around stars vary with evolution at the early and latestages, and therefore, the species and their relative abundances ofsilicate dusts should reflect the evolutionary stage of stars. In thepresent study, we will make silicate dusts from gas in laboratory byusing newly developed equipments. We will measure the formation rate,size, and optical constants of forsterite, enstatite, and amorphoussilicates as a function of condensation temperature, cooling rate,and composition of gas. The optical parameters for the condensateswill be also measured. The experimentally obtained data are used tomodel the formation and growth of silicate dusts in the circumstellarenvironments at the early and late stages, The results will becompared with the observation of silicate dust in young and evolvedstars by the Subaru telescope and IR spectroscopy, and the physicaland chemical environments in which those dusts were formed will beestimated.

【 Expected results 】

The present work will link the gap between astronomicalobservation and planetary material science in two aspects: it willshow the real feature of the condensed phases observed incircumstellar environments, and it will be able to show thephysico-chemical conditions of the circumstellar environments wherethe dusts were formed. The results will further give importantinformation about the finding of extra-solar planetary systems.

【 References by the principal researcher 】

Isotopic fractionation as a probe of heating processes in the solar nebula. Chem. Geol., 169 (2000) 45-68.
Precursor materials of the solar system, in <The evolving EarthSystem>, Section 2, (Univ. Tokyo Press) (2004) (in Japanese).

【 Term of project 】 F Y 2004 - 2008

【 Budget allocation 】 81,300,000 yen

【 Homepage address 】 in prep.