J247-002 **Room: 304** **Time: May 19 9:15-9:30**

Toward the general material evolutionary model of proto-planetary disk

Kiyoshi Kuramoto[1]

[1] Cosmosci., Hokkaido Univ.

http://www.ep.sci.hokudai.ac.jp/~keikei

Composition of raw materials of a planet is a basic parameter controlling the evolution of planetary surface and interior. Therefore, clarifying the evolutionary mechanisms and diversity of planetary raw materials in a proto-planetary disk contributes to understand the formation and evolution of habitable planets.

For last two decades, the dynamical evolution of proto-planetary disks has been extensively revealed by assist of observational studies. However, its understanding has yet been poorly extended for the material evolution especially in the terrestrial planet region inside 5 AU from the central star, partly because of the limitation of observational resolution.

Recently, unique and leading attempts to reconstruct the origin of planetary material are proposed in our country, which incorporate the understanding of dynamical evolution of proto-planetary disks. Those include the molecular origin hypothesis for the isotopic heterogeneity of oxygen, the most abundant elements in solid planets, quantitative experiments for the organic molecule formation on icy surface under the condition of molecular cloud, the nebular shock theory for the formation of chondrules which are the major components of primitive meteorites, the experimental suggestion for the growth of dust aggregates to planetesimal by stickiness of organic materials, and the in-situ composition analysis of small asteroid by proprietary space craft. All of these are central issues for clarifying the material evolution from interstellar cloud to planetary raw materials.

Combination of these advanced researches is expected to give us new unified understanding for the evolution of planetary raw materials. To accomplish this, the following researches are suggested to be promoted as well as the extension of previous studies;

1) Construction of global evolutionary model: A numerical model simulating the global thermal history and isotopic and chemical evolution from a molecular cloud to proto-planetary disk is developed incorporating the material transport mechanisms clarified by dynamical studies and the physical properties of materials constrained by experiments. The results are compared with chronological and other data obtained from primitive meteorites.

2) Modeling and parameterization of local scale processes: Physical processes for the formation of constituents of primitive meteorites are constrained with revealing their effects on the isotopic exchange between gas-condensates and constraining of physical processes of formation of meteoritic constituents such as chondrules with estimates of their effects on the isotopic exchange and the composition of nebula gas. The results are incorporated into the global evolutionary model.

3) Effect of diversity of boundary conditions: Diversity of proto-planetary material evolution is clarified by estimate the effects of variation in starting elemental abundance and star formation environment as observed.

Progress of those studies will provide some boundary conditions for the studies of formation and evolution of planets including the properties of planetary raw materials and nebula environment surrounding proto-planets. In addition, since the nebula gas is a potential source of proto-atmosphere, the study of thermal history and compositional evolution of proto-planetary disk may be coupled with the study of atmosphere formation. The picture obtained by those studies would provide rich targets for the high resolution observational studies on proto-planetary disks expectedly realized 10 or 20 years later.