**Japan Geoscience Union Meeting 2010**
(May 23-28 2010 at Makuhari, Chiba, Japan)


PPS004-P06 Room: Convention Hall Time: May 25 17:15-18:45

# Coagulation and settling of dust aggregates with porosity evolution in protoplanetary disks

Akimasa Kataoka[1*], Hideko Nomura[1], Satoshi Okuzumi[2], Yoshitsugu Nakagawa[3]

[1]Department of Astronomy, Kyoto Univ, [2]GSHES, Kyoto Univ, [3]Earth and Planetary Sciences, Kobe Univ

How micron-sized dust aggregates evolve to kilo-meter-sized planetesimals in protoplanetary disks is one of the most important problems of the planet formation. In many of the previous studies on the dust evolution dust grains have been assumed to be compact. The porosity of the aggregates, however, is expected to greatly affect the dust coagulation process through the change in the drag force from the gas.

In this study, we simulated coagulation of dust aggregates settling to an equatorial plane in a protoplanetary disk, taking into consideration the time evolution of the porosities of the aggregates. In the calculation of the porosities, we adopted a realistic model, QBCCA model, in which the porosity evolution depends on a mass ratio of colliding two aggregates (Okuzumi et al. 2009). As a disk model, the Minimum Mass Solar Nebula model is adopted. In a previous study it was shown that the compact dust grains at the disk scaleheight coagulate to be milli-meter size and then settle down to equatorial plane in 500 years in the earth orbit (Nakagawa et al. 1986). Meanwhile, our calculation showed that the porous aggregates continue to coagulate without sedimentation even at the disk scaleheight. This is because in the case of the porous aggregates the sedimentation speeds decrease due to the increase of the gas drag force. The fractal dimension of the porous aggregates was about 2 in our calculation. Moreover, we will calculate the optical depths at various disk radii and discuss the differences in the cases of the porous aggregates and the compact grains.

Keywords: protoplanetary disks, dust aggregates, coagulation, porosity