

Density evolution of dust aggregates growing in protoplanetary disks

Toru Suyama[1]; Koji Wada[1]; Hidekazu Tanaka[1]

[1] ILTS, Hokkaido Univ.

<http://risu.lowtem.hokudai.ac.jp/~toru/>

In protoplanetary disks, planetesimals are thought to be formed through the gravitational instability or simple coalescence. If the gravitational instability occurs, it needs that dust aggregates becomes large aggregates (\sim cm) that gas drag force is not efficient. Small dust aggregates have the fluffy structure. However, dust aggregates are compressed as they grow. Thus, large dust aggregates can not keep such fluffy structure. Such compression changes the cross section of dust aggregates and the gas drag force which governs the dust motion. Thus, when and how to compression is important on dust growth.

In this study, we perform the N-body simulation of aggregate collisions. In our simulation, using the aggregates obtained at previous collision, we repeat the calculation s of aggregate collision to examine the structure evolution during aggregate growth. For simplicity, we consider only head-on collisions of icy aggregates.

In our simulation, collisions between dust which have a variety of the mass and the density occur. We examined the density change at such collisions. As a result of numerical simulation, when the impact velocity is lower than a few m/s, the density hardly increases. On the other hand, when the impact velocity is higher than a few tens of m/s, the fragmentation occurs.

We introduce