

Absorption and Scattering Cross Sections of Large Aggregate Particle

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It is widely believed that the comet supplies rather larger dust particles with mmsize, and they remain as cometary trails along the orbit of parent comet against the solar radiation forces [1]. These larger particles seem to be an aggregates consisting of smaller elementary dust grains. The physical properties of such larger aggregates play an important role in estimating their dynamical evolution after releasing from the cometary nucleus, as well as in analyzing their thermal/optical emission features of the comet.

We present our simulation results of absorption and scattering cross sections of large aggregate particles. These physical parameters of dust grain are useful to determine the equilibrium temperature and its resulting thermal emission spectra, as well as radiation pressure forces, gas drag forces, and Poynting-Robertson drag forces.

By using Monte-Carlo simulations, we first calculate the geometrical cross-section A and surface area S of fractal aggregate, defined as BPCA (Ballistic Particle-Cluster Aggregate) and BCCA (Ballistic Cluster-Cluster Aggregate), and compare the results with those of a sphere with the equivalent mass. We have confirmed that a ratio of S/A takes a value of about 4 even for aggregate particle as shown in [2]. Furthermore, we examine the multiple reflections by using a ray tracing on the surface of aggregate particle, and calculate its absorption property as well as a scattering property beyond a DDA code applicable range, i.e. a size parameter > 15. The results will be presented in our poster.

References

- [1] Ishiguro, M. et al. ApJ., Letter 589, L101-L104 (2003).
- [2] Kitada,Y., Nakamura,R., and Mukai,T., Proc. of the 3rd International Congress on Optical Particle Sizing, .93-Yokohama, 121-125 (1993).