Morphological and light scattering properties of various fractal dust aggregates

Nisha Katyal[1] and Sanjay Puri[1]

[1]Jawaharlal Nehru University, New Delhi, India.

06 August 2012

Abstract

In this study, we have characterised some of the morphological properties of the fractal dust aggregates generated using a sequential algorithim. The fractals exists as domains of a particular domain length in the interstellar space. We present a simple and appealing method for determining the light scattering properties of these numerically generated fractal aggregates, based on the calculation of the pair correlation function and then fourier transforming it to yield the structure factor of the system. The behaviour of the intensity of light scattered as a function of scattering vector 'q' is studied in various small and large scale regimes as the system of scatterer evolves with time. This leads to the verification of Porod's law for such scatterers at different time scales. We observe a subsequent difference in the behaviour of the scattered intensity results of a single fractal aggregate and that of aggregates existing as domains over large areas of space.

We also study the various light scattering properties of these fractal dust aggregates such as absorption, scattering and extinction efficiencies using some of the complex and sophisticated light scattering tools like DDSCAT and T-Matrix. The results are then compared with the actual observations of the scattered light by comets.