

Shape dependence of dust absorption opacity in the Rayleigh domain

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In various astrophysical environments, dust absorption opacity must be assumed to estimate dust mass by observations. Cosmic dust particles often have radii smaller than FIR or more longer wavelengths, and hence, they are typically in the Rayleigh domain at these observing wavelengths. It is known that absorption opacity in the Rayleigh domain sensitively depends on the shape of dust particles. In this study, we study how dust coagulation alters absorption opacity in the Rayleigh domain by using the T-Matrix Method. We find that higher-order terms of harmonic expansion of the electromagnetic field must be taken into account to reproduce strong field appearing around contact points between monomer particles. As a result, we show that coagulation can enhance dust absorption opacity by a factor of about 2 for silicate and about 5 for carbonaceous particles. We discuss appropriate approximate methods to mimic the shape effect of dust absorption opacity.

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