

Study of Polarization Properties of Comet Halley Using a Mixture of Compact And Aggregate Particles

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The *in situ* measurements of comet Halley and the ‘Stardust’ returned samples of comet Wild 2 showed the presence of a mixture of silicates and organic refractory in cometary dust. In the present work, we propose a model which considers cometary dust as a mixture of aggregates and compact particles. We consider aggregates as ballistic cluster-cluster aggregate (BCCA) and ballistic agglomeration with one migration (BAM1) aggregate¹ and compact particles as spheroidal particles with some size distribution. For modeling comet 1P/ Halley, the power-law size distribution $n(a) \sim a^{-2.6}$, obtained from re-analysis of the Giotto spacecraft data², is taken. Using T-matrix code for polydisperse spheroids and Superposition T-matrix code for aggregates, the average simulated polarization curves are generated which can best fit to the observed polarization data at the three wavelengths $\lambda = 0.365\mu\text{m}$, $0.485\mu\text{m}$ and $0.684\mu\text{m}$. The best fitting complex refractive indices coming out from the present analysis correspond to a mixture of both silicates and organics, which are in good agreement with the *in situ* measurement of comet 1P/Halley by different spacecraft. The model successfully reproduces the positive part as well as the negative branch of the polarization at the above three wavelengths.

Keywords: Comet; dust; polarization; scattering; aggregates.

References

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