A UNIFIED MODEL OF INTERSTELLAR GRAINS

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ABSTRACT

An interstellar grain model is presented to explain simultaneously such basic observations as wavelength dependences of (1) interestellar extinction, (2) linear, and (3) circular polarization. The grain model is composed of two populations in size wise, namely, core-mantle particles (in sub-micron size range) and very small uncoated particles (generally less than 0.01 micron). In calculating extinction cross-sections wave-length dependence of indices of refraction has been taken into account for olivine, ice and graphite. In addition size-dependent degree of alignment has been used for polarization cross-sections.

An extensive discussion will be made for effects of particle alignment on (1) and shape of polarization curve, (2) the ratio to extinction, and (3) interrelationships between maximum-polarization wavelength (λ_{max}) and total-to-selective extinction ratio (R). It is found that the very low degree of particle alignment in diffuse clouds makes Serkowski's empirical formula so successful in describing almost all of the observed polarization curves by a single expression. Excessively large values of polarization-to-extinction ratio associated with dense clouds are interpreted as a consequence of high degree of parrticle alignment in such clouds . The resulting implications are discussed briefly with respect to magnetic field strengths in dense clouds.

RADIO OBSERVATIONS OF H_2CO MOLECULES IN DARK CLOUDS

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ABSTRACT

The 4.3 GHz H_2CO absorption lines have been observed in the directions of dark clouds and mapped closely in several dark clouds. The line intensites, half-widths, and radial velocities of H_2CO lines have been examined, and compared with those of other molecular lines. The H_2CO distributions in dark clouds are compared with distributions of dusts derived from star-counting methods. The H_2CO column densities and total masses of H_2CO clouds are calculated.