

Polarimetric signatures of aligned and optically active (“homochiral”) dust particles: can we distinguish between them?

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Scattering of light by any type of cosmic dust and planetary aerosols always produces some linear polarization. Its degree and polarization plane are sensitive to the characteristics of the scattering particles, specifically their size, shape and composition. Circular polarization arises at more special conditions, namely, when the scattering medium or the scatterers themselves are characterized by some mirror asymmetry. Most common sources of circular polarization are alignment of elongated dust particles or their optical activity (circular birefringence and dichroism). The last case is of a special interest as optical activity is typical for homochiral, i.e. life-related, molecules and, thus, circular polarization can indicate presence of biological or pre-biological organics. There are numerous observations of circular polarization, e.g. in molecular clouds and comets; in future we may see it studying atmospheres of extrasolar planets. In all cases it is important to distinguish what is the cause of the circular polarization, specifically to prove or disprove its biological origin. We explore how this can be done combining linear and circular polarization. We use spectral and angular dependences of linear and circular polarizations obtained at computer modeling of light scattering by complex, including optically active, particles and at laboratory simulations of light scattering by biological objects.