Polarization of molecular bands in comets: Overview

N. Kiselev[1]

[1]Main Astronomical Observatory, National Academy of Sciences of Ukraine

The spectra of comets are composed of emission lines of atoms, ions, and neutral molecules as well as of a continuum produced by the solar light scattered by dust particles in the coma or tail. Polarimetry of the continuum is a recognized tool for the study of physical properties of dust particles and light-scattering mechanisms in comets. Less attention has been paid to the polarimetry of cometary molecular emissions. However, the linear and circular polarimetry of molecular bands can be used to clarify the mechanism of the fluorescent polarization of different emissions and as a diagnostic for the presence or absence of a magnetic field in comets. We present an overview on the polarimetry of the molecular bands for OH (3090 Å), CN (3880 Å), C_2 (5140 Å), C_3 (4060 Å), and NH_2 (6630 Å) as well as the NaD_2 (5890 Å) atomic resonance line observed for different comets. The polarization of molecular bands caused by fluorescence is generally assumed to follow the well-known theoretical dependence, due to Öhman, as a function of the phase angle. A detailed comparison of observational data with Öhman's expression is presented for all measured molecular bands. All cases of deviations of the polarization plane from the perpendicular to the scattering plane as well as deviations of the degree of polarization from the theoretical dependence are discussed in the framework of the contravention of the fluorescence mechanism. A new representation of the phase-angle dependence of the fluorescence polarization is discussed.