

Spectropolarimetric Signals of Comet 2P/Encke During Its 2017 Apparition

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Comets are the least altered reservoir of the materials left over from the formation epoch of the solar system. They are considered as a mixture of ice and dust components. We study their physiochemical properties to constrain the early condition of the solar system and/or to deduce the evolutionary sequence they have undergone. In general, linear polarization of cometary dust has been exploited to constrain physical properties (e.g., dust size, porosity). However, observations of the dust polarization degree in optical have suffered from the depolarization of gas emissions permeating into the filter wavelengths we are interested in. Besides, polarimetric properties of such gas contaminants are rarely under investigation, just being considered as the one which must be eliminated from the signal. In this regard, spectropolarimetry can be a powerful tool to investigate the properties of gas and dust free from mutual contamination. This strategy offers a series of information on polarization degree of both components as well as on wavelength dependence of polarization degree and polarization angle simultaneously. Herein, we present our new spectropolarimetric study of comet 2P/Encke which is one of the well-studied comets for its shortest orbital period and observed characteristics. We obtained the spectropolarimetric data over the wavelengths of 0.50–0.97 μm utilizing the Hiroshima Optical and Near-Infrared camera (HONIR) at the Higashi-Hiroshima Observatory on UT 2017 February 21 at large phase angle of $\alpha = 75.^\circ 7$. We find that the polarization degree of dust-scattered light of 2P/Encke is significantly higher than any other cometary species observed at the similar phase angles. In addition, we report the polarization degrees of gas molecules of C₂, and firstly of NH₂ ammonia- α band and of CN-red system in each transitional branch. Finally, we will discuss our polarimetric results of 2P/Encke in terms of its unique orbital property.

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