



Polarimetry of comet 2P/Encke: Two classes of comets?

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We present results of imaging and aperture polarimetry of gas-rich comet 2P/Encke in the range of phase angles 91-105°, obtained during the 2003 apparition. The imaging observations of comet 2P/Encke were carried out at the 2-m RCC telescope of the Bulgarian National Astronomical Observatory on November 20-22, 2003. The narrow-band filters IF663 ($\lambda_0 = 6621 \text{ \AA}$, FWHM = 59 \AA) and IF642 ($\lambda_0 = 6416 \text{ \AA}$, FWHM = 26 \AA) were used to select the (0-7-0) transition of the α ammonia band of NH_2 and the adjacent red continuum. Aperture polarimetry in the wide-band UBVR filters was performed at the 2.6-m Shain telescope and 1.25-m telescope of the Crimean Astrophysical Observatory on November 17-24, 2003.

From the imaging observations the intensity distribution of dust and NH_2 and its polarization in comet 2P/Encke was derived. The different contribution of the NH_2 emission in both narrow-band filters was taken into account. The polarization of the (0-7-0) transition of the α ammonia band amounts to 8% at phase angles close 90°, similar to the polarization of the two-atomic molecules CN and C_2 . The continuum emission in comet 2P/Encke is almost circular symmetric around the nucleus with a slight extension into the fan. Its polarization at phase angles 91-95° exceeds 30% i. e. is ever higher than that for dusty comets. This contradicts the idea that the dust in gas-rich comets like comet 2P/Encke has a lower polarization than in dust-rich comets. But the degree of polarization of comet Encke's dust derived from aperture measurements was about 8%, i. e. significantly less. Evidently the division of comets into a

dust-rich and a gas-rich class with different maxima of polarization is an artifact. The observed low degree of polarization in gas-rich comets is caused by the fact that even filters designed to exclude strong molecular emissions transmit enough faint molecular emissions to significantly reduce the measured polarization in dust-poor comets. The aperture measurements of gas-rich comets with wide-band filters are even more susceptible to this effect.

The dust of so-called gas-rich comets like comet Encke usually does not show superheat or the silicate feature at $10\ \mu\text{m}$. This indicates that the dust grains in such comets should be larger than the grains in so-called dust-rich comets. The question if large dust grains can have a high degree of polarization will be discussed but at present cannot be definitely answered.