

A Dusty Nova in the LMC: Unraveling Its Evolution Through Lightcurve and Spectra

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ABSTRACT

We present a detailed spectrophotometric study of nova LMCN 2009-05a, located in the Large Magellanic Cloud (LMC). Photometric observations reveal a dust dip in the optical light curve, classifying it as a D-class nova. Light curve analysis yields t_2 and t_3 decline times of approximately 46 and 80 days, respectively, placing the nova in the category of moderately fast novae. Spectroscopic observations cover multiple phases, including pre-maximum, early decline, and nebular. The spectra are initially dominated by hydrogen Balmer and Fe II lines with P-Cygni profiles, which later transition into pure emission. During the optical minimum, a discrete absorption feature was observed in the $H\alpha$ and [O I] line profiles. The physical and chemical properties during the early decline and nebular phases were analyzed using the photoionization code CLOUDY. Dust temperature, mass, and grain size were estimated through spectral energy distribution fitting to the WISE data. On day 395 post-outburst, we estimate the dust temperature to be approximately 700 K. Additionally, we examined the correlation between dust condensation time (t_{cond}) and t_2 for LMC novae, finding a trend consistent with previous studies of Galactic novae.