N09a Physical properties of the C_{60} PN SaSt 2-3 and its surrounding environment

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We performed detailed analyses of the very young and interesting fullerene C_{60}-containing planetary nebula (PN) SaSt 2-3 to investigate physical properties of the central star (B0-1II) and nebula and its surrounding environment. We derived the abundances of the nine elements using our own Subaru/HDS and the archived Spitzer/IRS spectra. By analysing the stellar absorption, we derived the effective temperature, surface gravity, and photosphere He/C/N/O/Si abundances. We first report time-variation of the radial velocity measured using the stellar absorption, indicating a binary central star. Comparison between the observed elemental abundances and the prediction by asymptotic giant branch (AGB) nucleosynthesis models indicates that a progenitor was an initially $\sim$1.25 $M_\odot$ star with $Z = 0.001$ and α-element rich ([α/Fe]$\sim$+0.3-0.4). We tried to derive the distance (10.75 kpc) to be consistent with the post-AGB evolution of the 1.25 $M_\odot$ stars. By adopting a cylinder-shape nebula, we can explain the energy balance between the central star and the gas and dust as well as all the observed quantities in the photoionization model. We detected several diffuse interstellar bands (DIBs) toward this PN. Amongst these bands, the radial velocity of the DIB centered at 4428 Å proposed as a candidate for larger fullerene is consistent with the systemic radial velocity of SaSt 2-3. We could not detect three UV electronic transition C_{60} bands in the HDS spectrum. These facts imply that the progenitor was born in the large fullerene-rich ISM and SaSt 2-3 has a nebula enriched with larger fullerene and fullerene/PAH adducts rather than pure C_{60}.