N17a Physical Properties of Fullerene-containing PN Lin49 in the SMC

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Planetary nebulae (PN) represent by far the largest fraction of fullerene $C_{60,70}$ detections, having been reported in about 25 objects in the Milky Way and the Magellanic Clouds. All fullerene-containing PNe are very young, low-excitation objects, and their IR-spectra are fairly similar (e.g., Otsuka et al. 2014,MNRAS,437,2577). However, it remains unclear what physical properties of the central stars and the nebulae favour the formation of fullerenes in these objects, and what differentiates them from their non-fullerene containing counterparts. To answer these questions, we started the project to fully characterize properties of the central stars and dusty nebulae in fullerene-containing and non-containing PNe using multiwavelength spectra.

Lin49 is a C_{60}-containing PN in the Small Magellanic Cloud, it shows the broad 11 μm/16-24 μm/30 μm features. These dust features have seen in other fullerene-containing PNe. The strengths of the 17.4 μm/18.9 μm C_{60} bands are comparable to those in the PNe Tc1 and SaSt2-3 in the Milky Way. The near-IR excess seen in Lin49 suggests that very small grains could be dominant in its dusty nebula. By fittings to stellar absorption lines of the central star, we derived stellar abundances of six elements, effective temperature, and surface gravity. Based on over 200 nebular lines detected in the ESO/VLT XSHOOTER spectrum, we calculated nebular abundances of ten elements. Lin49 is a very young, low excitation ($T_{\rm eff}$=30 000 K, log g=3.2 cm s^{-2}) and metal-deficient object ([Ar/H]=–1.5). In this talk, we present a recent result of our Lin49 work.