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OH maser-emitting planetary nebulae.

Roldán A. Cala[1], José F. Gómez[1], and Luis F. Miranda[1]

[1] Instituto de Astrofísica de Andalucía, CSIC, Glorieta de la Astronomía s/n, E-18008 Granada, Spain

Abstract

The expected evolution of the Sun and stars with initial masses up to 8 $M_\odot$, after the asymptotic giant branch phase, will be to form a planetary nebula (PN) ionized by a central star (CS). Searching for extremely young PNe is important to better characterize the onset of this transitional phase. In particular, OH maser-emitting PNe (OHPNe) are considered nascent PNe. In fact, only 6 OHPNe are known to date. Using high-resolution optical spectra on Vy 2-2, the first OHPN identified, we report a kinematical age of $\sim$135 $\pm$ 90 yr (for a distance of 3 $\pm$ 2 kpc) for the very compact ionized central region of this PN. Moreover, our spectra reveal an unexpected C-rich nature for its CS. The ejected circumstellar matter is O-rich, where dense photoionized gas, silicate dust, water ice and OH masers coexist in an environment with C/O $<$ 1. Therefore, Vy 2-2 is a nascent O-rich PN around a C-rich CS. The formation of this kind of dual-chemistry in PNe is not well understood. Also, in order to identify more OHPNe, we processed the unpublished continuum data of the interferometric follow-up of an OH maser line survey that covered 176 deg^2 of the Southern Galactic Plane and the Galactic Center. We then cross-matched the interferometric positions of the OH maser and radio continuum emission, considering the latter as a possible tracer of free-free emission from photoionized gas, which is characteristic of PNe. Out of the 933 OH maser line sources in that survey, we report 8 objects with a positive coincidence between maser and radio continuum emission, 4 of which are bona fide OHPNe, and other 4 are identified as OHPNe candidates for the first time (OH 341.6811+00.2634, IRAS 16372−4808, IRAS 17494−2645 and IRAS 18019−2216). Hence, these results could significantly increase the number of known members of nascent PNe.

My poster is available at https://zenodo.org/record/7051527