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THE ONSET OF PHOTOIONIZATION IN POST-AGB STARS

A. Manchado,[1] C. Domínguez-Tagle,[1] A. García-Hernández,[1] F. Prada,[2] P. García-Lario,[3] and G. Conway[4]

During the post-AGB phase the dust shell detaches from the central star and dust temperatures varies between 100 and 200 K. In order to study the onset of photo-ionization in post-AGB stars, IRSPEC near-infrared spectroscopy of 40 IRAS sources from the Point Source Catalogue was conducted. In 27 of the post-AGB observed Brγ is detected. In addition, molecular emission lines of H_2 1–0 $S(1)$ and 2–1 $S(1)$ were detected in 11 objects. The observations show that all the sources but one, with molecular emission, exhibit photoionization. A detailed description and discussion of the results are presented.

The objects presented here were first identified as post-AGB stars through near-infrared photometry (Manchado et al. 1989; García-Lario et al. 1997). Five of these objects exhibiting H_2 emission have been observed with the HST (WFPC2), and they show bipolar morphology. Detailed descriptions of the object's images can be found in Sahai, Bujarrabal, & Zijlstra (1999); Hrivnak, Kwok, & Su (1999); Bobrowsky et al. (1998) and García-Lario, Riera, & Manchado (1999).

The Brγ emission line (2.166 μm) was detected in 27 IRAS sources. The H_2 1–0 $S(1)$ emission line (2.122 μm) was detected in 10 of the objects showing Brγ emission and in one object that does not show Brγ. From those 10 objects, 6 were also detected in the H_2 2–1 $S(1)$ emission line (2.248 μm). In addition, $v = 2$–0 CO emission (2.293 μm) was detected in 3 of the 20 objects observed.

The integrated fluxes in Brγ, H_2 1–0 $S(1)$, and H_2 2–1 $S(1)$ (not corrected for extinction) have been calculated with an estimated uncertainty of 10%.

TABLE 1

OBSERVED LINE RATIOS

Object	$\frac{H_2\ 1\text{–}0\ S(1)}{\mathrm{Br}\gamma}$	$\frac{H_2\ 1\text{–}0\ S(1)}{H_2\ 2\text{–}1\ S(1)}$
IRAS 06556	0.1	≤ 1.7
IRAS 06562	0.1	3.3
IRAS 07027	0.2	≤ 1.2
IRAS 10178	1.4	24.8
IRAS 10197	0.4	≤ 2.7
IRAS 14331	3.1	7.9
IRAS 16594	5.8	31.0
IRAS 17119	0.1	1.3
IRAS 17150	...	≤ 10.5
IRAS 17311	19.9	10.2
IRAS 18062	4.8	...

The H_2 1–0 $S(1)$/2–1 $S(1)$ ratio vary from 1 to 31 with an uncertainty of approximately 20%. An upper limit of the flux was estimated when the H_2 2–1 $S(1)$ line was not detected. Calculated H_2 1–0 $S(1)$/Brγ ratios vary from 0.1 to 5.8 (with the exception of IRAS 17311, for which the ratio is 19.9) indicating different evolutionary stages.

[1]Instituto de Astrofísica de Canarias, E–38200, La Laguna, España.
[2]Centro Astronómico Hispano–Alemán, E–04080, Almería, España.
[3]ISO Data Centre, Astrophysics Division, ESA, E–28080, Madrid, España.
[4]Dept. of Physics and Astronomy, University of Calgary, Alberta T2N 1N4, Canada.

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