On the nature of the 30-μm feature in carbon-rich Planetary Nebulae

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Recently, we searched the Spitzer Space Telescope archive for Galactic Planetary Nebulae observed with the Infrared Spectrograph (IRS), showing the characteristic resonances due to C_{60} at 17.4 and 18.9 μm (Otsuka et al. 2013, MNRAS). We identified 11 such sources, including five that were previously known to contain fullerenes. The spectra all show a prominent 30-μm feature, commonly attributed to MgS (Hony et al. 2002, A&A 390, 533). However, doubt was cast over this identification by Zhang & Kwok (2011, ApJ 730, 126), using energetic and abundance arguments. We explore the possibility that the 30-μm feature is an intrinsic resonance to the carrier of the cold dust continuum, by constructing an astronomical carbon-dust opacity table, and fitting it to all 10 of the sources in our sample for which sufficient spectral data are available. We are able to achieve a good fit in all cases, implying that the carrier of the dust continuum and the 30-μm feature can indeed be one and the same material. Indeed, the graphite opacities presented by Draine & Lee (1984, ApJ 285, 89) show a strong resonance around 40 μm, which may shift to shorter wavelengths when the conductivity of the graphite changes (Jiang et al. 2013, IAU Symp. 297).