Physical Structure of the Planetary Nebula NGC 3242 from the Hot Bubble to the Nebular Envelope

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One key feature of the interacting stellar winds model of the formation of planetary nebulae (PNe) is the presence of shock-heated stellar wind confined in the central cavities of PNe. This so-called hot bubble should be detectable in X-rays. Here we present XMM-Newton observations of NGC 3242, a multiple-shell PN whose shell morphology is consistent with the interacting stellar winds model. Diffuse X-ray emission is detected within its inner shell with a plasma temperature ~2.35\times10^6 K and an intrinsic X-ray luminosity ~2\times10^30 ergs s^(-1) at the adopted distance of 0.55 kpc. The observed X-ray temperature and luminosity are in agreement with "ad-hoc" predictions of models including heat conduction. However, the chemical abundances of the X-ray-emitting plasma seem to imply little evaporation of cold material into the hot bubble, whereas the thermal pressure of the hot gas is unlikely to drive the nebular expansion as it is lower than that of the inner shell rim. These inconsistencies are compounded by the apparent large filling factor of the hot gas within the central cavity of NGC 3242. Subject headings: planetary nebulae: individual (NGC 3242)

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