

Analysis of the WN star WR 102c, its WR nebula, and the associated cluster of massive stars in the Sickle Nebula

The massive Wolf-Rayet type star WR 102c is located near the Quintuplet Cluster - one of the three massive star clusters in the Galactic Center region. Previous studies indicated that WR 102c may have a dusty circumstellar nebula and is among the main ionizing sources of the Sickle Nebula associated with the Quintuplet cluster. We obtained observations with the ESO's VLT integral field spectrograph SINFONI in the K-band, extracted the stellar spectra, and analyzed them by means of stellar atmosphere models. Our new analysis supersedes the results reported for WR 102c previously. We significantly revise down its bolometric luminosity and hydrogen content. We detect four early OB type stars close to WR 102c. These stars have radial velocities similar to that of WR 102c. We suggest that together with WR 102c these stars belong to a distinct star cluster with a total mass of about $1000 M_{\odot}$. We identify a new WR nebula around WR 102c in the SINFONI map of the diffuse Br γ emission and in the HST's Pa α images. The Br γ line at different locations is not significantly broadened and similar to the width of nebular emission elsewhere in the H II region around WR 102c. The massive star WR 102c located in the Galactic Center region resides in a star cluster containing further early type stars. The stellar parameters of WR 102c are typical for hydrogen-free WN6 stars. We newly identify a nebula surrounding WR 102c that has a morphology similar to other nebulae around hydrogen-free WR stars, and propose that the formation of this nebula is linked to interaction of the fast stellar wind with the matter ejected at previous evolutionary stage of WR 102c.

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