Surface abundances of ON stars

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Massive stars burn hydrogen through the CNO cycle during most of their evolution. When mixing is efficient, or when mass transfer in binary systems happens, chemically processed material is observed at the surface of O and B stars. ON stars show stronger lines of nitrogen than morphologically normal counterparts. Whether this corresponds to the presence of material processed through the CNO cycle or not is not known. Our goal is to answer this question. We perform a spectroscopic analysis of a sample of ON stars with atmosphere models. We determine the fundamental parameters as well as the He, C, N, and O surface abundances. We also measure the projected rotational velocities. We compare the properties of the ON stars to those of normal O stars. We show that ON stars are usually helium-rich. Their CNO surface abundances are fully consistent with predictions of nucleosynthesis. ON stars are more chemically evolved and rotate - on average - faster than normal O stars. Evolutionary models including rotation cannot account for the extreme enrichment observed among ON main sequence stars. Some ON stars are members of binary systems, but others are single stars as indicated by stable radial velocities. Hence, mass transfer is not a simple explanation for the observed chemical properties. We conclude that ON stars show extreme chemical enrichment at their surface, consistent with nucleosynthesis through the CNO cycle. Its origin is not clear at present.

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Comments:

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