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Atmospheric chemical composition of the "twin" components of equal mass in the CP SB2 system 66 Eri

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Abstract

We determine the atmospheric chemical composition of the components of the CP SB2 system 66 Eri with approximately equal masses (MA/MB = 0.97) by using two CCD echelle spectra of the star. These spectra have been taken with the 1-m telescope at Special Astrophysical Observatory with a spectral resolution of 36000 and a signal-to-noise ratio no less than 100 in the wavelength range 4385-6695 Å. The model-atmosphere parameters for the components are estimated by analyzing all available photometric and spectrophotometric data and the equivalent widths of iron lines. For components A and B, we have obtained TeffA = 11100 K, TeffB = 10900 K, loggA = 4.25, loggB = 4.25, VturbA = 0.9 km s-1, VturbB = 0.7 km s-1, and v siniA,B = 17 km s-1. The derived projected rotational velocities of the components, together with the HIPPARCOS parallax and photometric observations, show that their rotation may be synchronized with the orbital period. The star exhibits a considerable infrared excess at wavelengths longer than 25 μm. The synthetic-spectrum and model-atmosphere methods are used to determine the atmospheric abundances of 26 chemical elements in component B and 15 chemical elements in component A. The components differ markedly in chemical composition. The peculiar component B exhibits no chemical anomalies that are typical of the Hg-Mn group, such as an underabundance of He and Al and an enhancement of P and Ga, but shows large heavy-element overabundances reaching 4-5 dex. The atmosphere of component A also exhibits moderate overabundances of Mn and Ba, but no lines of other heavy elements have been found in its spectrum. However, an estimate of the upper limit on their abundances does no rule out small heavy-element Noverabundances in the atmosphere of component A either. 66 Eri is the first and the only close SB2 system with CP non-Hg-Mn components studied to date.