ANALYSIS OF THE SPECTRUM OF Hg - Mn STAR HR 4072

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ABSTRACT

Hg - Mn star HR 4072 with extremely narrow lines has been studied using the spectra with reciprocal dispersion D=4.2 A/mm (spectral resolution $\delta\lambda$ = 0.08 A), obtained with the Coude spectrograph of the 2-m telescope of NAO Bulgarian Academy of Sciences. Within the wavelength region 3700-4800 A the detailed identification is fulfilled and equivalent line widths W of the primary and secondary components of this spectroscopic binary star are measured. Independent spectrum processings in SAO and NAO have shown the high precision of the Measured И values and the absence of any systematic disagreements.

As a result of the investigation the possibility is shown to apply the atmosphere models with normal (solar) chemical abundance for analysis of Hg -Mn star atmospheres. This allows to plan the future fulfilment of atmosphere quantitative analysis for a large sample of this type stars in open clusters the spectra of which are obtained on the 6-m telescope by one of the authors (Klochkova V. G.).

Using the method of atmosphere models for the main component HR 4072 we determined the effective temperature, surface gravity, microturbulent velocity ξ_T, and abundances of 15 chemical elements. The iron abundance in HR 4072 is normal, α -process elements (Mg, Si, Ca, Sc) show a weak deficit α /Fe} = -0.24 dex, for s-process elements (Sr, Y, Zr, Ba) a considerable excess is observed <s/Fe> = +1.15 dex. The abundance of heavy elements (Sm, Gd, Hg) is thousand times higher than the solar one; the abundance of the peculiar Mn element (Mn/Fe) = +1.4 dex is essentially increased, and ionization equilibrium exist for Mn and Mn^+.

The peculiarities of abundance pattern such as excesses of heavy elements and violation of odd-even effect qualitatively agree with the hypothesis of diffuse separation of chemical elements under the conditions of stable atmosphere. At the same time

for a number of elements the obtained results contradict the predictions of this theory. For Fe^{+} and Mn^{+} ions the basic condition of diffusion mechanise effectiveness is fulfilled: Mn ion spectrue is richer with lines than the Fe^{+} spectrum, but Mn initial abundance is noticeably lower than that of Fe.

The study of the effect of magnetic intensification of Ti, Fe, Fe^{+} lines showed that there is no statistically reliable relations between Ti and Fe abundances, determined from separate lines at the fixed $\frac{3}{T}$ value, and Lande factors.

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