n-CAPTURE ELEMENTAL ABUNDANCES IN ACTIVE AND NON-ACTIVE STARS

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ABSTRACT. Abundances of Y, Zr, La, Ce, Nd, and Sm have been obtained under LTE approximationss. The program stars were observed at high resolution, high signal to noise ratio with the ELODIE echelle spectrograph (OHP, France). Among them more than 30 stars are active stars with a fraction of BY Dra and RS CVn type stars. Comparison of the behavior of n-capture elemental abundance in active and non active stars was made.

Key words: Stars: fundamental parameters; stars: abundances; stars: kinematics; stars: atmospheres; Galaxy: stellar content.

1. Introduction

Studying of the stars of the lower part of the Main Sequence we have found about 30 active stars (BY Dra type) and the difference in Li abundance for active and non active stars (Mishenina et al., 2008). In this work we continue the chemical abundance investigation of these stars and have turned our attention to the elements of neutron capture.

2. Observations and spectra processing

The spectra of 89 stars were obtained in the region of the $\lambda\lambda$ 4400–6800 ÅÅand with S/N about 100–350 using the 1.93 m telescope at the Observatoire de Haute-Provence (OHP, France) equipped with the echelle-spectrograph ELODIE (Barrane et al., 1996), resolving power is R = 42000. The spectral processing carried out by (Katz et al., 1998; Galazutdinov, 1992).

3. Parameter and abundance determination

Effective temperatures $T_{\rm eff}$ were estimated by the line depth ratio method (Kovtyukh et al., 2003). The relations combine the effective temperature with a set of spectral line depth ratios. The internal accuracy of the effective temperature determined in this way is rather high in the temperature range 4000 K to 6000 K: typically 150 K or less (standard deviation or 10 to 20 K for the standard error). Another very important advantage of this method (or any spectroscopic method) is that it produces the reddening-free $T_{\rm eff}$ estimates.

Surface gravities log g were determined by two methods: parallaxes and ionization balance of iron. The microturbulent velocity V_t was determined on the independence of the iron abundance log A(Fe) obtained from given Fe I line from equivalent width EW of this line.

Abundances of Y, Zr, La, Ce, Nd, and Sm have been obtained under LTE approximations with 9–12 lines of YII, 3–4 lines of ZrII, 5–6 lines of LaII, 10–13 lines of CeII, 8–11 lines of NdII, 4–5 lines of SmII with the solar oscillator strengths (Kovtyukh & Andrievsky, 1999). Model of the atmospheres and the code WIDTH9 of Kurucz were used (Kurucz, 1993).

Influence of parameters determination and spectra processing (Sp) on n-capture elemental abundance determination for example of stars HD 139813 ($T_{\rm eff}$/log g/V_t/[Fe/H] = 5408/4.5/1.2/0.0) given in Table 1.

4. Results and conclusion

Comparison of the behavior of n-capture elemental abundance [El/Fe] vs. [Fe/H] in active (filled circles) and non active (open circles) stars in the region of metallicities from [Fe/H] = –0.3 to [Fe/H] = +0.3 was presented in Fig. 1 (see below). As can see from Figures, in the region of metallicities from [Fe/H] = –0.3 to [Fe/H] = +0.3 all elements (except Y) demonstrate the trend of abundance with [Fe/H] and the deficient of abundance at [Fe/H]> –0.2. This trend of the elemental abundance corresponds to the received earlier results for this region of [Fe/H].

Table 1: Influence of parameter determination and spectra processing (Sp) on abundance determination.

Elem	$\Delta T_{\rm eff}$	$\Delta \log g$	$\Delta V_{\rm t}$	Δ[Fe/H]	Sp	Total
Y	0.00	–0.11	–0.02	0.07	0.02	0.13
Zr	0.01	–0.12	0.00	0.07	0.02	0.14
La	0.00	–0.12	0.00	0.07	0.02	0.14
Ce	–0.01	–0.12	–0.01	0.07	0.02	0.14
Nd	–0.02	–0.13	–0.01	0.07	0.02	0.15
Sm	–0.02	–0.13	–0.01	0.08	0.02	0.15

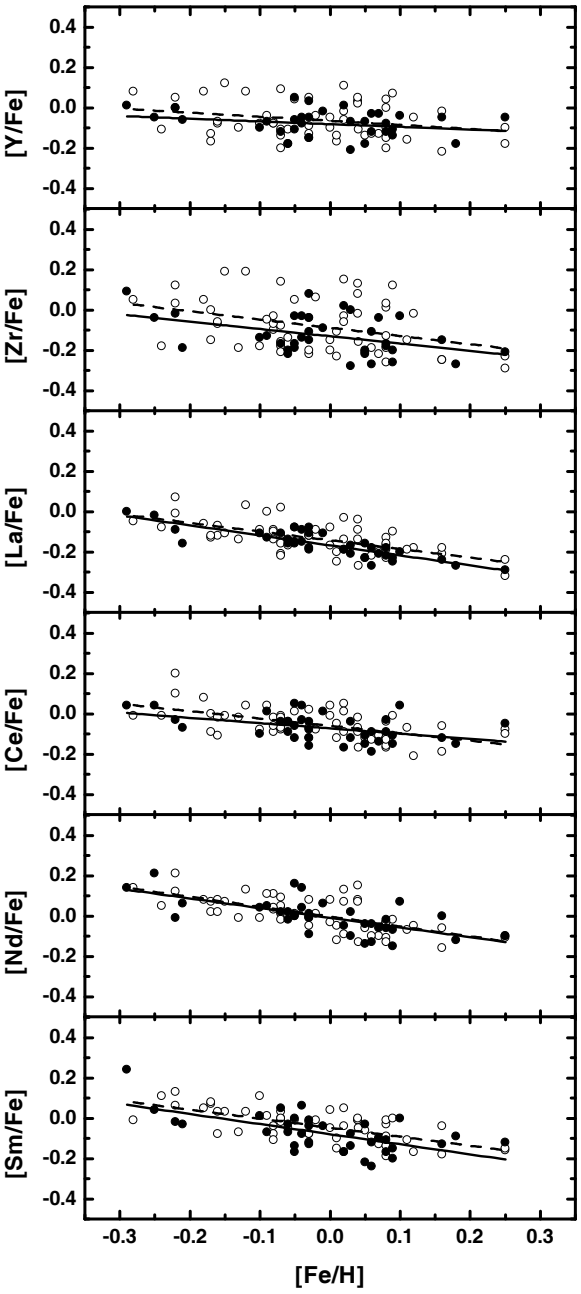

Figure 1: Trends of studied elements with [Fe/H] of non active (open circles, dashed line) and active (black circles, solid line).

For active and non active stars we observed the insignificant difference between elemental abundance that it is in the limits of determination errors. It permit to us use the obtained data in the galactic chemical evolution investigation.

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