LINES SELECTION TO DETERMINE THE CHEMICAL COMPOSITION OF STARS IN THE RANGE -3 ≤ [FE/H] ≤ -0.7

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ABSTRACT. Using the spectra obtained with echelle spectrograph SOPHIE (1.93 m telescope, OHP, France) and the data from about 20 papers of various authors, we have compiled a list for around four thousand lines of different chemical elements. Based on the spectra of the Sun and stars and also synthetic spectrum calculations in different ranges of metallicity, we selected 300 unblended lines of FeI, FeII and 200 lines of YII, ZrI, ZrII, LaII, CeII, PrII, NdII, SmII, GdII, that are recommended for the study of the chemical composition.

Key words: Stars: abundance – Stars: late-type

To study of the F, G, K-dwarfs and giants in a wide range of metallicity (-3 ≤ [Fe/H] ≤ -0.7) based on the spectra obtained with high resolution and signal to noise ratio (S/N) is need to create the list of unblended lines for the determination of chemical abundances.

The spectra for the thirty appropriate stars were selected from the archives of the spectrograph SOPHIE (Perruchot et al. 2008) at 1.93 m telescope (OHP, France). Processing of the spectra was performed using the new version of the DECH20 software by Galazutdinov (1992).

To create the list of the iron and s-and r-process - capture lines, we used some works (e.g. Boyarchuk et al. 1998; Grevesse N., et al. 1999; Sneden et al. 2009; Lawler et al. 2009; Takeda et al. 2005; Lai et al. 2008; Aoki W., et al. 2007; Ramirez I., et al. 2007; Pakhomov Yu.V., et al. 2011; Simmerer J., et al.: 2004; Coluzzi R. 1993; Den Hartog E.A., et al. 2006; Lawler J.E., et al. 2006 etc.) and we selected about four thousand lines of chemical elements. The atomic parameters of this line list were taken from the database VALD (Kupka et al. 1999). The elemental abundances were computed using the solar spectrum (S/N = 332) and the spectrum of the star HD6582 (S/N = 321) with this line list under the WIDTH program by Kurucz (1993). As a result 1600 unblended lines remained. Most of them there are the neutral iron lines (about 980 lines). The chemical composition of the Sun was calculated (by the model with parameters T_{eff} =5780 K, log =4.45, V_t = 0.8, [Fe/H] = 0) and compared with that given in Grevess et al (2010). Then for five stars using 820 lines of FeI, FeII, YII, ZrI, ZrII, LaII, CeII, PrII, NdII, SmII, GdII the chemical composition was computed and compared with the data from (Fulbright 2000; Gratton, et al., 2003 etc).

Finally, based on synthetic spectra calculation for stars with different metallicity we selected about 300 lines of FeI and FeII and about 200 lines of n-capture elements.

Results and conclusions

1. We selected about 500 unblended lines of FeI, FeII, YII, ZrI, ZrII, LaII, CeII, PrII, NdII, SmII, GdII.
2. This list of lines was tested for the five previously investigated stars.

Selected lines are recommended to study the elemental abundance both with the use of equivalent widths and for line profile computations.

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