SULFUR ABUNDANCE IN THE GALACTIC DISC STARS

O.P.Paramonova, T.V.Mishenina, O.Chepizhko

Astronomical Observatory, Odessa National University
T.G.Shevchenko Park, Odessa 65014 Ukraine
astro@paco.odessa.ua

ABSTRACT. The sulfur abundance was determined by the synthetic spectrum method in the stars with metallicity close to that of the Sun. The comparison with the results of other authors, as well as the nucleosynthesis computations were made.

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

Introduction.There are several sulfur lines in the spectra of stars; those lines have hyperfine structure (HFS), and therefore, the sulfur abundance determinations are not currently available for a large sample of stars. The Type-II supernovae are the major sources of sulfur, and the knowledge of the sulfur abundance is important for the development of theories of nucleosynthesis and chemical evolution of the Galaxy. The subjects of this study are stars of the Galactic disk.

The spectra of 27 stars were obtained with S/N about 100-350 using the 1.93 m telescope at the Observatoire de Haute-Provence (OHP, France), equipped with the echelle-spectograph ELODIE. The resolving power is R = 42 000. The spectral processing was carried out by (Katz et al., 1998; Galazutdinov 1992).

The parameters of the investigated stars were taken from the studies by (Mishenina et al. 2013). The effective temperatures Teff were estimated using the line depth ratio method. The surface gravities lg (g) were computed by two methods, namely the iron ionization balance and the parallax.

The abundances of sulfur were obtained under the LTE approximations upon the synthetic spectrum method, taking into account the HFS and the oscillator strengths of lines by Korotin (2009). The Kurucz model of atmospheres (Kurucz, 1993) and the new version of the STARSP code by Tsymbal (1996) were used. We used the sulfur and iron lines in the region of 6743-6762 ÅÅ. The NLTE corrections for those lines did not exceed 0.1 dex (Korotin, 2009). Fig. 1 shows the observed (as dotted) and synthetic (as line) spectra fitted for star HD108954.

Results and conclusions. The behavior of the sulfur abundance in the region of metallicity from [Fe/H] = -2 to [Fe/H] = +0.3 is presented in Fig.2 with the model predictions by Timmes et al. (1995) and the data of other authors (our data – as asterisks, Clegg et al. 1981 – as triangles, Francois 1987, 1988 – as squares and circles). The lines show the computed data with the factor of 2 variations in the iron yields from massive stars.

As is seen from the Fig.2, in the region of metallicity from [Fe/H] = -1 to [Fe/H] = +0.3 sulfur demonstrates the trend of its abundance with [Fe/H] and underabundance below [Fe/H] = -0.2. The abundance of sulfur, produced by the massive-star models with Z>0.1, is balanced by the iron production from the Type-Ia supernovae, which keeps the [S/Fe] ratio relatively flat in the Population I stars (Timmes et al., 1995). But the production of all stable sulfur isotopes in the massive-star models is not sufficient to explain obtained abundance trend.

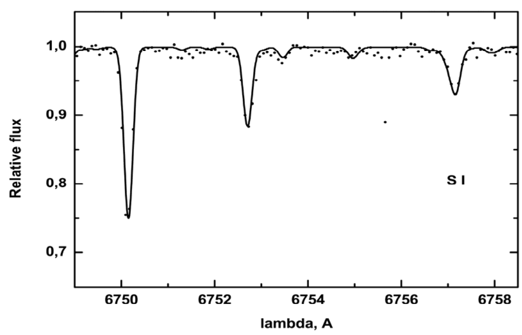

Fig.1. The observed and synthetic spectra fitting

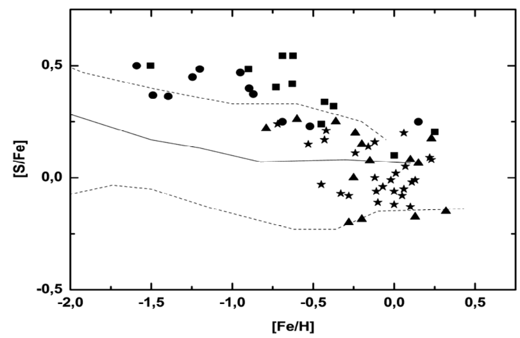

Fig.2. Dependence of [S/Fe] vs.[Fe/H]

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