Abundances of neutron-capture elements in stars of the galactic disk substructures

Author(s) Mishenina, T. V.; Pignatari, M.; Korotin, S. A.; Soubiran, C.; Charbonnel, C.; Thielemann, F. -K.; Gorbaneva, T. I.; Basak, N. Yu.
Author(s) at UniBasel Thielemann, Friedrich-Karl ; Pignatari, Marco ;
Year 2013
Title Abundances of neutron-capture elements in stars of the galactic disk substructures
Journal Astronomy & astrophysics
Volume 552
Pages / **Article-Number** 128
Keywords nuclear reactions, nucleosynthesis, abundances, stars: abundances, stars: late-type, Galaxy: evolution
Aims. The aim of this work is to present and discuss the observations of the iron peak (Fe, Ni) and neutron-capture element (Y, Zr, Ba, La, Ce, Nd, Sm, and Eu) abundances for 276 FGK dwarfs, located in the Galactic disk with metallicity -1 < [Fe/H] < +0.3.Methods. Atmospheric parameters and chemical composition of the studied stars were determined from an high resolution, high signal-to-noise echelle spectra obtained with the echelle spectrograph ELODIE at the Observatoire de Haute-Provence (France). Effective temperatures were estimated by the line depth ratio method and from the H-alpha line-wing fitting. Surface gravities (log g) were determined by parallaxes and the ionization balance of iron. Abundance determinations were carried out using the LTE approach, taking the hyperfine structure for Eu into account, and the abundance of Ba was computed under the NLTE approximation.Results. We are able to assign most of the stars in our sample to the substructures of the Galaxy thick disk, thin disk, or Hercules stream according to their kinematics. The classification of 27 stars is uncertain. For most of the stars in the sample, the abundances of neutron-capture elements have not been measured earlier. For all of them, we provide the chemical composition and discuss the contribution from different nucleosynthesis processes.Conclusions. The [Ni/Fe] ratio shows a flat value close to the solar one for the whole metallicity range, with a small scatter, pointing to a nearly solar Ni/Fe ratio for the ejecta of both core-collapse SN and SNIa. The increase in the [Ni/Fe] for metallicity higher than solar is confirmed, and it is due to the metallicity dependence of Ni-56 ejecta from SNIa. Under large uncertainty in the age determination of observed stars, we verified that there is a large dispersion in the AMR in the thin disk, and no clear trend as in the thick disk. That may be one of the main reasons for the dispersion, observed for the s-process elements in the thin disk (e.g., Ba and La), whereas much narrower dispersion can be seen for r-process elements (e.g., Eu). Within the current uncertainties, we do not see a clear decreasing trend of [Ba/Fe] or [La/Fe] with metallicity in the thin disk, except maybe for super-solar metallicities. We cannot confirm an increase in the mentioned ratios with decreasing stellar age.
Publisher Springer
ISSN/ISBN 0004-6361
edoc-URL http://edoc.unibas.ch/dok/A6223325
Full Text on edoc No;
Digital Object Identifier DOI 10.1051/0004-6361/201220687
ISI-Number WOS:000317912000127

Document type (ISI) Article