Detailed Abundance Analysis for Planet Host Stars

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ABSTRACT

We have obtained the spectra of 166 F, G, K type stars including 93 planet host stars using BOES (BOAO Echelle Spectrograph) with BOAO 1.8 m telescope. The spectroscopic parameters for model atmosphere were determined by self-consistent fine analysis of Fe lines. By the measurements of equivalent widths (EWs), we estimated the abundances of 25 elements including n-capture elements, such as C, N, O, Na, Mg, Al, Si, K, Ca, Sc, Ti, V, Cr, Mn, Co, Ni, Cu, Zn, Sr, Y, Zr, Ba, Ce, Nd, and Eu. And the S abundance was determined by synthetic spectrum of triplet lines near 6757 Å. For abundance analysis, the accuracy of EW measurement is very important so that we have developed the TAME (Tool for Automatic Measurement of Equivalent-width) for fast and uniform measurement of a large set of EWs.

As a results, we have confirmed that the mean metallicity of planet host stars are 0.13 dex higher than that of comparison stars. For elements other than iron, we have found that the mean value of [Mn/H] ratio for planet host stars are as much as 0.22 dex higher than for comparisons. And we note that the difference of mean [X/H] ratio is more than 0.15 dex for Na, Co, N, Al, Cu, Ni, Sc, and Si, in order of difference. Furthermore, we have performed the Kolmogorov-Smirnov test (K-S test) for [X/H] ratios between two groups of planet host stars and comparison stars and investigated the proportion of planet host stars to all samples in each bin of [X/H] ratio. As a result, we find that it is fairly not possible that the distribution of [X/H] belonged to the same population, for the elements of O, Na, Mg, Al, Si, and Zn. And we observe that the proportion of planet host stars is increasing with [X/H] ratios as an exponential function for C, O, Mg, Si, S, Ca, Sc, Cr, and Zn.

In addition to this, the opacities and equation of states (EOS) of the chemical mixtures have been calculated from the elemental analysis. Then, the evolutionary phases of the planet host stars have been computed in the context of standard stellar models. Between theoretical model grids, the detailed physical dimensions of the best model have been determined.

Keywords : stars: chemical abundances — stars: fundamental parameters — stars: planetary systems