

Non-LTE Analysis of the Si II Lines in ι Her with Various Atomic Data Sets

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This study shows that the statistical equilibrium of Si II in the atmosphere of a B3 IV type star ι Her is extremely sensitive to a variation in photoionization cross-sections for the Si II levels. The difference in abundances derived from absorption lines of Si II between applying the data from two equal accuracy sources, namely, the Opacity Project (OP) and the NORAD database, amounts to 0.18 dex, on average. Using the hydrogenic approximation for photoionization cross-sections, we obtain the departure coefficients for the Si II $4s^2S$ level, the source function for Si II 6371 Å, and the abundance derived from this line, which are very similar to the corresponding values computed by Takeda (2021). We suppose that close-to-solar abundance obtained by Takeda (2021) from Si II 6371 Å in ι Her is due to using the hydrogenic photoionization cross-sections for the Si II levels. However, emission lines of Si II observed in ι Her can only be reproduced with the OP photoionization cross-sections. Photoionization cross-sections for the Si II levels need further improvements.

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