Invited lecture

THE CHEMI-IONIZATION PROCESSES
# IN THE SOLAR PHOTOSPHERE

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In this work it is examined the role of the chemi-ionization processes in symmetric atom-Rydberg atom collisions from the aspect of the influence on the hydrogen Rydberg atom populations in the solar photosphere. Here we keep in mind the processes:

$$H^*(n) + H(1s) \rightarrow H(1s) + H^+ + \overrightarrow{e},$$
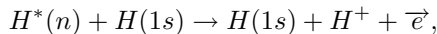
where principal quantum number $n \gg 1$, and $\overrightarrow{e}$ denotes the free electron. By now such and similar chemi-ionization processes were considered in connection with the atmospheres of some M red dwarfs and some DB white dwarfs. However the conditions in plasma of the solar photosphere should also provide the possibility of the occurring of the described chemi-ionization processes. Because of its importance, examination of any new process which could influence on its properties deserves an especial research. In this work the intensivities of the described chemi-ionization processes were determined as the function of the temperature T and the hydrogen atom densities $N(n)$, where $n \geq 1$, within the solar photosphere on the base of the existing standard non-LTE model. Than intensities were compared with the intensities of the processes of the ionization of $H^*(n)$ atoms by electron impact. It was shown that in the especially important region $n \leq 10$ intensities of described chemi-ionization processes are dominant, or at list are comparable with the intensities of mentioned electron-Rydberg atom ionization processes. Consequently the results obtained in this paper suggest the necessity of the including of the described chemi-ionization processes in future models of the solar photosphere.