Parametric Study of Molecular Line Polarization in the Solar Atmosphere

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1. Extended abstract

The polarimetric observations of the quiet sun show linear polarization in molecular lines of C_2, MgH, etc. The molecular lines are very faint in the intensity spectrum. Q branch transitions of MgH are considered in this study. Using radiative transfer calculations, we find that the intensity and polarization profiles of MgH lines can be matched for a range of inelastic collisional rates (Γ_I) and depolarizing elastic collision rates ($D^{(2)}$) of the transitions in solar atmosphere. It is shown that the physical constraints imposed on these parameters can be used to estimate them. This procedure also allows us to get the oscillator strength (f). It is found for the strong line 5156.652 Å, $f = 0.12$, $\Gamma_I = 5.59 \times 10^7 \, \text{sec}^{-1}$ and $D^{(2)} = 1.29 \times 10^8 \, \text{sec}^{-1}$. Most of the other lines observed are weak by a factor of 3 in intensity compared to the 5156.652 Å line but show a polarization value of the order of 0.08%. One such typical line is 5156.997 Å. This line can be fitted for the parameters $f = 0.04$, $\Gamma_I = 1.22 \times 10^7 \, \text{sec}^{-1}$ and $D^{(2)} = 2.95 \times 10^7 \, \text{sec}^{-1}$.