It is well known, that HD is an isotopologue of the most abundant molecule in the Universe, H_2. We present a simple semi-analytical description of $N(HD)/N(H_2)$ ratio depending on physical conditions in molecular clouds in the diffuse interstellar medium. We found asymptotics for HD/H_2 ratio in different parts of the cloud, namely, self-shielded part, where all H and D are in H_2 and HD molecules, edge of the cloud, where H_2 molecular fraction, f_{H_2}, is low and UV field is unattenuated and region, where UV field is still unattenuated, but values of f_{H_2} are intermediate. We have also described D/HD transition and found that at low metallicities it happens at lower penetration of UV field into the cloud than H/H_2 transition. Our formalism allowed us to estimate physical parameters in the medium, namely, cosmic ray ionization rate, UV field intensity, number density using measured values of $N(HD)$ and $N(H_2)$. We also compared our results with *Meudon PDR* code calculations, which calculates full chemical equation network and radiative transfer and found a good agreement with our results.

References

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