TABLE II. Spectral positions of the rotational spectral lines (in nanometers), which belong to the Q-branch of the (0–0), (1–1), and (2–2) bands of the Fulcher-α system of H_2.

Transition	$Q1$	$Q2$	$Q3$	$Q4$	$Q5$	$Q6$
(0–0)	601.83	602.38	603.19	604.27	605.61	607.20
(1–1)	612.18	612.72	613.54	614.62	615.96	
(2–2)	622.48	623.03	623.84	624.92	626.25	

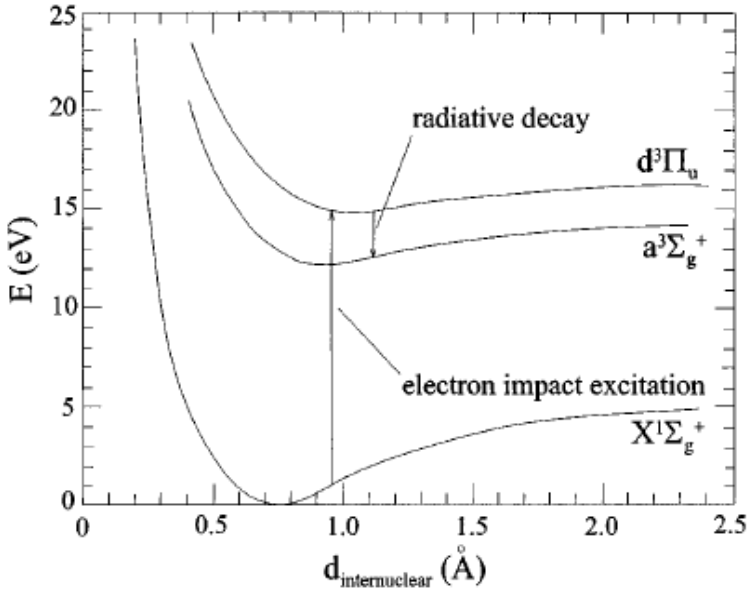

FIG. 6. Potential energy curves for hydrogen molecule.

Table 1. Rate coefficients ($cm^3\ s^{-1}$) of the direct and dissociative excitation of the H_α and H_β lines by electron impact, calculated using a Maxwell EEDF at various electron temperatures T_e. The calculated data are given for the case when redistribution of populations can be neglected (case 1) and in the case of a Boltzmann distribution over the fine structure sublevels (case 2).

	Direct excitation				Dissociative excitation			
	H_α		H_β		H_α		H_β	
T_e (eV)	Case 1	Case 2	Case 1	Case 2	Case 1	Case 2	Case 1	Case 2
0.5	6.2[illegible]−20	4.97E−20	5.60[illegible]21	3.93E−21	5.[illegible]−25	2.63E−25	[illegible]−26	2.90E−27
1	1.4[illegible]14	1.15E−14	2.39[illegible]15	1.70E−15	1.[illegible]E−17	5.94E−18	[illegible]E−18	1.10E−19
1.5	8.[illegible]−13	7.03E−13	1.[illegible]E−13	1.26E−13	3.[illegible]−15	1.77E−15	4.[illegible]E−16	3.65E−17
2	[illegible]E−12	5.43E−12	1.4[illegible]−12	1.07E−12	6.6[illegible]−14	3.06E−14	7.[illegible]E−15	6.55E−16
2.5	2.[illegible]E−11	1.84E−11	5.1[illegible]−12	3.82E−12	3.[illegible]E−13	1.69E−13	[illegible]0E−14	3.68E−15
3	4.[illegible]E−11	4.14E−11	1.1[illegible]−11	8.86E−12	1.1[illegible]−12	5.28E−13	1.[illegible]E−13	1.17E−14
3.5	8.[illegible]E−11	7.38E−11	2.14[illegible]11	1.61E−11	2.[illegible]E−12	1.19E−12	3.[illegible]E−13	2.68E−14
4	1.26[illegible]10	1.14E−10	3.[illegible]−11	2.53E−11	4.[illegible]E−12	2.20E−12	5.[illegible]−13	5.03E−14
4.5	1.[illegible]E−10	1.60E−10	4.6[illegible]11	3.58E−11	7.[illegible]2E−12	3.55E−12	9.[illegible]E−13	8.26E−14
5	2.[illegible]E−10	2.09E−10	6.10[illegible]11	4.73E−11	1.[illegible]−11	5.21E−12	[illegible]3E−12	1.24E−13
5.5	2.7[illegible]−10	2.61E−10	7.59[illegible]11	5.94E−11	1.[illegible]E−11	7.15E−12	2.[illegible]E−12	1.73E−13
6	3.2[illegible]−10	3.14E−10	9.[illegible]−11	7.19E−11	2.03[illegible]11	9.32E−12	2.[illegible]−12	2.31E−13
6.5	3.[illegible]E−10	3.68E−10	1.0[illegible]−10	8.45E−11	2.5[illegible]−11	1.17E−11	3.[illegible]E−12	2.95E−13
7	4.[illegible]E−10	4.21E−10	1.21[illegible]−10	9.71E−11	3.0[illegible]11	1.42E−11	4.[illegible]E−12	3.65E−13
7.5	4.[illegible]E−10	4.74E−10	1.35[illegible]−10	1.10E−10	3.67[illegible]11	1.69E−11	5.[illegible]E−12	4.42E−13
8	5.[illegible]E−10	5.26E−10	1.49[illegible]−10	1.22E−10	4.2[illegible]−11	1.96E−11	6.[illegible]E−12	5.23E−13
8.5	5.5[illegible]−10	5.77E−10	1.6[illegible]E−10	1.34E−10	4.[illegible]E−11	2.24E−11	7.[illegible]E−12	6.08E−13
9	5.9[illegible]−10	6.27E−10	1.[illegible]E−10	1.46E−10	5.[illegible]−11	2.53E−11	8.[illegible]E−12	6.96E−13
9.5	6.[illegible]E−10	6.75E−10	1.87[illegible]10	1.57E−10	6.1[illegible]11	2.82E−11	9.[illegible]E−12	7.88E−13
10	[illegible]70E−10	7.22E−10	1.98E[illegible]10	1.68E−10	6.7[illegible]−11	3.11E−11	1.[illegible]E−11	8.81E−13
11	[illegible]8E−10	8.12E−10	2.20[illegible]10	1.89E−10	8.0[illegible]E−11	3.71E−11	1.[illegible]E−11	1.08E−12
12	7.[illegible]8E−10	8.96E−10	2.4[illegible]−10	2.09E−10	9.[illegible]E−11	4.30E−11	[illegible]0E−11	1.28E−12
13	[illegible]3E−10	9.76E−10	2.5[illegible]−10	2.28E−10	1.0[illegible]10	4.88E−11	1.[illegible]E−11	1.48E−12
14	9.0[illegible]−10	1.05E−09	2.7[illegible]10	2.45E−10	1.1[illegible]−10	5.46E−11	1.[illegible]E−11	1.69E−12
16	9.8[illegible]E−10	1.18E−09	3.0[illegible]−10	2.77E−10	1.43[illegible]10	6.57E−11	2.[illegible]E−11	2.09E−12
18	1.[illegible]E−09	1.30E−09	3.2[illegible]−10	3.05E−10	1.6[illegible]−10	7.64E−11	2.[illegible]E−11	2.48E−12
20	1.[illegible]E−09	1.41E−09	3.4[illegible]−10	3.29E−10	1.88[illegible]10	8.64E−11	3.[illegible]6E−11	2.85E−12
25	1.[illegible]E−09	1.63E−09	3.81[illegible]−10	3.79E−10	2.37[illegible]−10	1.09E−10	[illegible]4E−11	3.69E−12
30	1.3[illegible]−09	1.79E−09	4.05[illegible]−10	4.18E−10	2.78[illegible]−10	1.28E−10	[illegible]7E−11	4.39E−12
40	1.3[illegible]−09	2.03E−09	4.33[illegible]−10	4.71E−10	3.4[illegible]−10	1.58E−10	6.[illegible]E−11	5.46E−12
50	1.4[illegible]−09	2.18E−09	4.46[illegible]10	5.05E−10	3.89[illegible]−10	1.79E−10	7.[illegible]E−11	6.19E−12
75	1.[illegible]E−09	2.39E−09	4.5[illegible]−10	5.48E−10	4.5[illegible]−10	2.08E−10	8.[illegible]E−11	7.14E−12
100	1.[illegible]E−09	2.48E−09	4.57[illegible]10	5.64E−10	4.[illegible]E−10	2.22E−10	8.[illegible]E−11	7.48E−12

Table 2. Rate coefficients K^{ex}_{mol} ($cm^3\ s^{-1}$) for the excitation of the $d\ ^3\Pi_u^-$, $v = 2$, $N = 1$ level of molecular hydrogen by electron impact from the ground electronic–vibronic state, calculated using a Maxwellian EEDF at various electron temperatures T_e multiplied with the radiative lifetime of this state τ_{d-21} and the radiative transition probabilities A^{d-21}_{a21} of the transition $d\ ^3\Pi_u^-$, $v = 2, N = 1 \rightarrow a\ ^3\Sigma_g^+$, $v = 2$, $N = 1$.

T_e (eV)	$A^{d-21}_{a21}\tau_{d-21}K^{ex}_{mol}$	T_e (eV)	$A^{d-21}_{a21}\tau_{d-21}K^{ex}_{mol}$	T_e (eV)	$A^{d-21}_{a21}\tau_{d-21}K^{ex}_{mol}$
0.5	1.06E−22	6	1.94E−11	14	4.19E−11
1	2.10E−16	6.5	2.22E−11	16	4.26E−11
1.5	2.45E−14	7	2.48E−11	18	4.24E−11
2	2.54E−13	7.5	2.73E−11	20	4.18E−11
2.5	1.00E−12	8	2.94E−11	25	3.91E−11
3	2.46E−12	8.5	3.14E−11	30	3.58E−11
3.5	4.58E−12	9	3.32E−11	40	2.99E−11
4	7.21E−12	9.5	3.47E−11	50	2.51E−11
4.5	1.02E−11	10	3.61E−11	75	1.72E−11
5	1.33E−11	11	3.83E−11	100	1.27E−11
5.5	1.64E−11	12	4.00E−11		

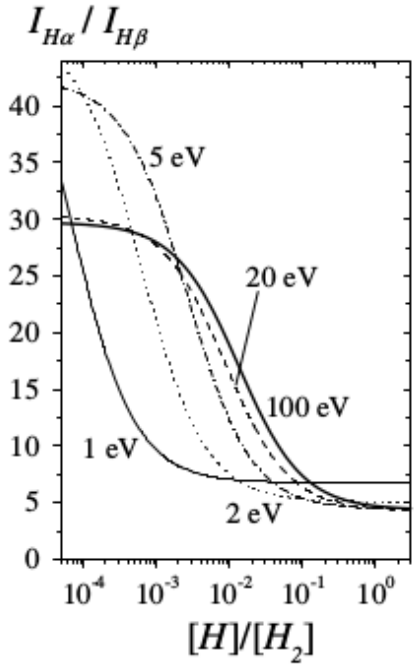

Figure 4. The ratio of intensities of H_α and H_β lines I_{H_α}/I_{H_β} as function of the density ratio of atomic and molecular hydrogen, calculated for case 2 at various T_e^{eff}.

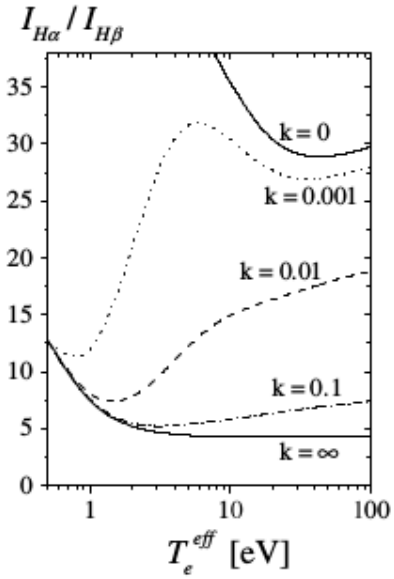

Figure 5. The ratio of intensities of H_α and H_β lines I_{H_α}/I_{H_β} as function of T_e^{eff} calculated for various ratios of densities of atomic and molecular hydrogen ($k = [H]/[H_2]$) for case 2.

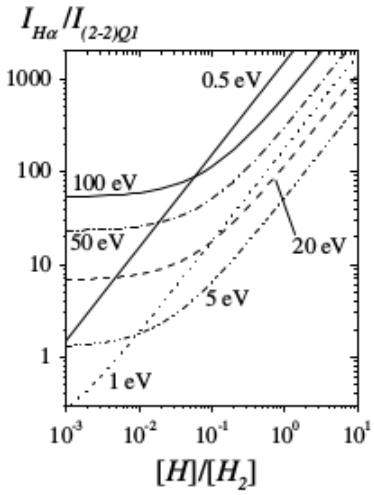

Figure 7. The ratio of intensities of H_α and (2-2)Q1 lines $I_{H_\alpha}/I_{(2\text{-}2)Q1}$ as a function of the density ratio of atomic and molecular hydrogen [H]/[H_2], calculated for case 2 at various T_e^{eff} and $T_g = 1000$ K.

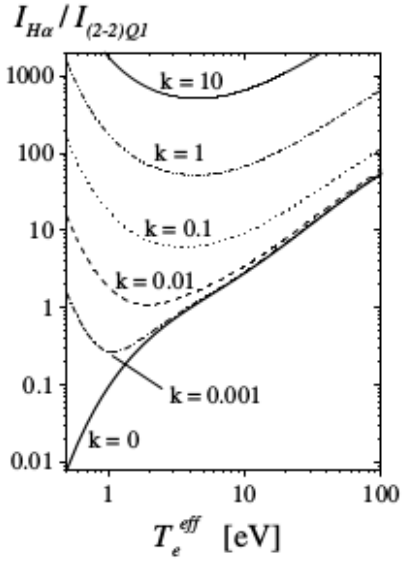

Figure 8. The ratio of intensities of H_α and (2-2)Q1 lines $I_{H_\alpha}/I_{(2\text{-}2)Q1}$ as a function of T_e^{eff} calculated for various ratios of densities of atomic and molecular hydrogen ($k = [H]/[H_2]$) at a $T_g = 1000$ K.