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Erratum: Radiative association in Li+H revisited: the role of quasi-bound states

by O. J. Bennett, A. S. Dickinson,[★] T. Leininger and F. X. Gadéa

Key words: errata, addenda – atomic data – atomic processes – early Universe.

The paper ‘Radiative association in Li+H revisited: the role of quasi-bound states’ was published in Mon. Not. R. Astron. Soc. **341**, 361–368 (2003). We have discovered that there was an error in this paper. This error arose in the code for calculating dipole matrix elements involving quasi-bound levels with high rotational angular momentum (and hence high collision energy). The contribution from these quasi-bound levels to the radiative association rate coefficient was overestimated substantially.

Values for the resonance contribution to the rate coefficient have been recalculated using the original molecular data. While there have been some more recent calculations of the LiH X ¹Σ⁺ potential energy curve (Li & Paldus 2003; Gadéa & Leininger 2006), the changes from the earlier values are small and are not expected to affect the calculation of the radiative association rate coefficient significantly.

Revised results, including the background contribution (Bennett et al. 2003) and the revised resonance contribution, are listed in Table 1.

These new results are compared in Fig. 1 with the earlier results of Stancil & Dalgarno (1997). Also shown are the results from a fit to our revised calculations:

$$\alpha(T) = 3.983 \times 10^{-20} \exp\{-0.246T/(1000K)\} + 4.355 \times 10^{-4} [T/(1000K)]^3 \text{ cm}^3/\text{s}.$$

The difference between this fit and the full calculation is less than 7 per cent for temperatures between 50 K and 10000 K.

While the revised results still show an enhancement of the rate coefficient over that from earlier calculations (Stancil & Dalgarno 1997), the effect is much smaller than that obtained previously.

Our previous work (Bennett et al. 2003) also discussed radiative association from the Li(2p) level. While our calculations for that process suffered from a similar problem, it was concluded in the earlier paper that the resonance contribution to radiative association proceeding through the molecular A ¹Σ⁺ state had been included in the calculations of Gianturco & Gori Giorgi (1996) and that, in any case, for Li(2p) radiative association through the B ¹Π molecular state was more important.

Table 1. Spontaneous radiative association rate coefficients, α for Li(2s) + H(1s), as a function of temperature, T.

>T (K)	α ($10^{-20} \text{ cm}^3 \text{ s}^{-1}$)
50.0	3.86
60.0	3.82
70.0	3.79
80.0	3.76
90.0	3.74
100.0	3.73
150.0	3.72
200.0	3.76
300.0	3.81
400.0	3.78
500.0	3.71
600.0	3.62
700.0	3.51
800.0	3.40
900.0	3.29
1000.0	3.19
1200.0	2.98
1500.0	2.71
2000.0	2.34
3000.0	1.80
4000.0	1.43
5000.0	1.17
6000.0	0.97
7000.0	0.83
8000.0	0.71
9000.0	0.63
10000.0	0.55

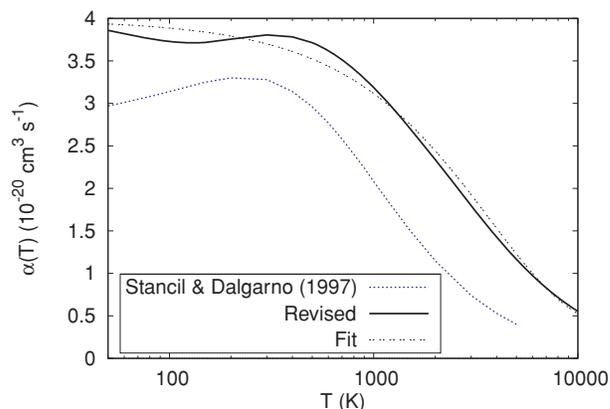


Figure 1. Rate coefficient for the process Li(2s) + H(1s) → LiH + hv.

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REFERENCES

Bennett O. J., Dickinson A. S., Leininger T., Gad a F. X., 2003, MNRAS, 341, 361
Gad a F. X., Leininger T., 2006, Theor. Chem. Acc., 116, 566
Gianturco F. A., Gori Giorgi P., 1996, Phys. Rev. A, 54, 4073

Li X., Paldus J., 2003, J. Chem. Phys., 118, 2470
Stancil P. C., Dalgarno A., 1997, ApJ, 479, 543

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