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Reinhard Caspary
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Errata, version 3

Acknowledgements:, line 3: replace 1995 by 1996.

page 11, line 33: "an f-electron" instead of "a f-electron".

page 13, line 6: replace "appropriate" by "respective".

page 15, line 16: replace "an constant" by "a constant".

page 22, table 1.4, headline: replace "interactions" by "configurations".

page 33, equation (2.20): replace σ by σ_{ij}.

page 34, secition 2.2, line 10: replace *appropriate* by *respective*.

page 36, equation (2.34): replace S_{ed} by S'_{ed}.

page 37, equation (2.42): delete $4\pi\epsilon_0$ and replace M_j by M_f.

page 39, equation (2.48): Denominator is $\hbar c$. Remove c from the definition of the Bohr magneton in the next line.

page 40, equation (2.51): add prime to χ_{md}.

pages 47,48, equations (3.28), (3.29) and (3.30): replace l by 1/2 in the Wigner-3j symbols for spin angular momenta.

page 54, Figure 4.1: replace quantum number $2S+1=3$ in all levels of Ce^{3+} and Yb^{3+} by $2S+1=2$.

page 55, equation 4.3: replace M_k by M_d.

page 57, equation (4.5): replace mass m by molar mass M.

page 57, table (4.1): Nominal LaF content is 17.5 mol%.

page 91, table 5.1: replace "initial" by "initial [39]".

page 95, table 5.4: replace "initial" by "initial [39]".

page 99, table 5.7: replace "initial" by "initial [39]".

page 128, equation (7.1): replace $\mathrm{d}\Phi(\nu)$ by $\mathrm{d}\Phi_\nu$.

page 132, line 2: correct V-number at 790 nm was 5.0.

page 140, equation (7.23): replace α_k by $-\alpha_k$.

page 142, equation (7.29): The equation ignores refraction and should be replaced by $\frac{1}{2}(1 - n_{clad}/n_{core})$.

page 143, line 6: "+" in equation for U is wrong, replace by $U = V^2 - W^2$.

page 169, equation (A.10): Remove subscript q from tensor $\mathbf{Q}^{(k)}$ in the reduced matrix element.

page 170, equations (A.15) and (A.16): Factor $\hbar$ is missing.

Enhancements

page 12, table 1.2: adding J as irreducible representation gives

l	groups	irreducible representations
1	$U_3 \supset R_3 \supset SO_3$	S, L, J
2	$U_5 \supset R_5 \supset R_3 \supset SO_3$	$S,\ W = (w_1 w_2),\ L,\ J$
3	$U_7 \supset R_7 \supset G_2 \supset R_3 \supset SO_3$	$S,\ W = (w_1 w_2 w_3),\ U = (u_1 u_2),\ L,\ J$

page 51, table 3.2: The symmetry group SO_3 belongs to the operator $\mathbf{J}^2/\hbar^2$.

chapter 2: I wanted to give equations of the line strength S, oscillator strength f and transitions rate A in a more consistent way than usually found in the literature. Unfortunately, it turns out, that the equations given in my thesis are still not fully consistent.

The origin of these problems is explained by equation (2.6), which can be used in the same way for S, f, and A. It links the dashed fundamental parameter for one polarization state and one initial and final Stark level to the undashed parameter, which is averaged over all polarisation states and Stark levels, as explained in the text. The important point is that the sum over q must be kept together with the factor 1/3, and the sum over M_i together with the factor $1/(2J_i+1)$ in the same equation. But in many cases in literature it had been overlooked that equations for the line strength already contained the summation implicitely. This happens for q by taking the scalar product of the dipole operator and for M_i and M_j by taking the reduced matrix element. In other words, the factor 1/3 is always the companion of the scalar product and the factor $1/(2J_i + 1)$ the companion of the reduced matrix element.

Strict application of this rule changes a couple of equations in the thesis:

$$A_{21} = \frac{64\pi^4\overline{\nu}^3}{hc^3}[\chi_{ed}S_{ed} + \chi_{md}S_{md}] \tag{2.8}$$

$$f_{ij} = \frac{4\pi\epsilon_0}{e^2}\frac{8\pi^2 m_e\overline{\nu}}{h}[\chi'_{ed}S_{ed} + \chi'_{md}S_{md}] \tag{2.12}$$

$$S_{ed} = \frac{e^2}{4\pi\epsilon_0}\frac{1}{3(2J_i+1)}\sum_{\lambda=2,4,6}\Omega_\lambda|\langle \mathrm{f}^N, \gamma_i J_i||\mathbf{U}^{(\lambda)}||\mathrm{f}^N, \gamma_j J_j\rangle|^2 \tag{2.45}$$

$$f_{ed} = \frac{4\pi\epsilon_0}{e^2}\frac{8\pi^2 m_e\overline{\nu}}{h}\,\chi'_{ed}S_{ed} \tag{2.46}$$

$$f_{md} = \frac{4\pi\epsilon_0}{e^2}\frac{8\pi^2 m_e\overline{\nu}}{h}\,\chi_{md}S_{md} \tag{2.51}$$

$$S_{md} = \frac{1}{4\pi\epsilon_0}\frac{1}{3(2J_i+1)}\frac{\beta_m^2}{\hbar^2 c^2}\,|\langle \mathrm{f}^N, \gamma_i J_i||\mathbf{L} + g_s\mathbf{S}||\mathrm{f}^N, \gamma_j J_j\rangle|^2 \tag{2.52}$$