THE RADIAL HAMILTONIANS FOR THE $A^1\Sigma^+$ and $X^1\Sigma^+$ STATES OF LiH and Li_2

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Extensive collections of literature data involving the $A^1\Sigma^+$ and $X^1\Sigma^+$ states of LiH and the $A^1\Sigma_u^+$ and $X^1\Sigma_g^+$ states of Li_2 have been employed in direct least-squares fits of the radially dependent Hamiltonians. Vibration-rotational and pure rotational transition energies for the ground $X^1\Sigma^+$ state of ^{6}LiH, ^{7}LiH, ^{6}LiD and ^{7}LiD, along with the entire collection of $A^1\Sigma^+ - X^1\Sigma^+$ emission and absorption data for the four isotopomers, are used in the fit for LiH; the data set for Li_2 consists of more than 6000 $A^1\Sigma_u^+ - X^1\Sigma_g^+$ absorption lines. The Born-Oppenheimer potentials are represented by a modified Lennard-Jones function that provides for correct behaviour in the near dissociation, long-range region of the potential. The LiH data set extends over $\approx$ 65% and 80% of the well depths of the $A^1\Sigma^+$ and $X^1\Sigma^+$ states, respectively, while the Li_2 data covers $\approx$ 70% and 99.97% of the well depths (extending out to more than 14 Å in the ground $X^1\Sigma_g^+$ state). The fits take full account of Born- Oppenheimer breakdown effects, and reproduce the measured line positions to within their estimated accuracies.