Energies for States of the $2s^22p^5$ and $2s2p^6$ in Fluorine-like Ions Between Si VI and W LXVI

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Abstract. Energies from relativistic configuration interaction (RCI) calculations are reported for the states of the $(1s^2)2s^22p^5$ and $2s2p^6$ configurations in all fluorine-like ions between Si VI and W LXVI. Valence, core-valence, and core-core correlation effects were accounted for through single-double expansions to increasing sets of active orbitals.

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The experimental energy levels and computed energies from the largest RCI calculations including QED corrections are displayed in Table 1. The computed energies agree very well with experimental values. Starting from Si VI the energy differences rapidly goes down to a few hundred cm^{-1}, which corresponds to an error of around 0.02 %.

From Sr XXX to Sn XLII experimental energies are given with error bars between 1000 and 2000 cm^{-1}. The calculated values are within the stated experimental error bars except for Cd XL and Sn XLII. The reason for the difference in these two ions is not known. Experimental data for ions from Sb XLIII to Ta LXV are not available. For the W LXVI ion, the differences between theoretical and experimental transition energies are a few thousand cm^{-1}. As discussed by Kramida [1] the total uncertainties of the measured energies in W LXVI were dominated by the calibration uncertainties and varied in the range 1.0 - 2.3 eV, which translates to 8000 - 20000 cm^{-1}. Based on the comparison between theory and experiment for the lighter ions as well as for W LXVI we estimate that the errors in the calculated transition energies for ions in the range Sb XLIII - Ta LXV, for which no experimental data are available, are less than 0.08 %.

TABLE 1. Energy levels in cm^{-1}

		Si VI			W LXVI		
Level	J	**Calc.**	**Obs. [2]**	**Diff.**	**Calc.**	**Obs. [2]**	**Diff.**
$2s^22p^5\ ^2P^o$	3/2	0			0		
	1/2	5093.02	5090.00	3.02	11203964.89	11201971.55	1993.34
$2s2p^6\ ^2S$	1/2	407480.13	406497.00	983.13	15049974.97	15054000.00	−4025.03

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