FINE AND HYPERFINE RESOLVED EMPIRICAL ENERGY LEVELS OF VANADIUM OXIDE (VO)

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Vanadium oxide (VO) is believed to play an important role in driving temperature inversion in the atmospheres of hot-Jupiters. It also characterises the spectra of late M and early L dwarfs and subdwarfs, where it is understood to be a significant opacity source. A MARVEL (measured active rotational-vibrational energy levels) analysis of the spectra of VO is performed, involving thirteen electronic states (6 quartets and 7 doublets). $^{51}V^{16}O$ data from 14 sources are used to form three networks: hyperfine-resolved quartets, hyperfine-unresolved quartets and hyperfine-unresolved doublets. A single quartet network is formed by deperturbing the hyperfine lines and 191 lines are assigned to an intercombination $2\ ^2\Pi$–X $^4\Sigma^-$ band system in the visible region previously recorded by Hopkins et al. (2009), allowing the doublet and quartet networks to be merged. As a result 6535/4393 and 8610/4641 validated transitions/final energies were obtained from analysis of the hyperfine-resolved/unresolved networks. T_0 energy values are determined for the $2\ ^2\Pi_{1/2}$, $\nu = 0, 1$ and $2\ ^2\Pi_{3/2}$, $\nu = 0$ states.