HYPERFINE-RESOLVED SPECTROSCOPIC MODEL AND HIGH-RESOLUTION LINE LIST FOR VANADIUM MONOXIDE (^{51}V^{16}O)

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Vanadium monoxide (^{51}V^{16}O) is believed to play an important role in the atmospheres of hot-Jupiters, but high-resolution studies have so far failed to detect it, at least in part because of the inaccuracy of available line lists.[1] It is likely that the large hyperfine splittings in the spectra of VO, arising from the large nuclear spin $I = \frac{7}{2}$ of the ^{51}V atom, has contributed to the non-detections with the current hyperfine-unresolved VOMYT line list[2]. To rectify this, a fully hyperfine-resolved spectroscopic model has been constructed which includes 15 low-lying electronic states (6 quartets and 9 doublets) of VO with the inclusion of hyperfine couplings based on use of the new, hyperfine-resolved version of the diatomic variational nuclear motion program Duo.[3]

The new spectroscopic model is refined against empirical MARVEL energies derived from experimental transitions,[4] and hyperfine couplings are fit for the 3 electronic states for which hyperfine effects have been resolved in lab spectra. The new line list comprises over 4 million energy level and 80 billion transitions and is made available via www.exomol.com.

[1] de Regt *et al.*, Astron. Astrophys., 165, 157 (2023)
[2] McKemmish *et al.*, Mon. Not. R. Astron. Soc., 463, 771 (2016)
[3] Qu, Yurchenko and Tennyson, J. Chem. Theory Comput., 18, 1808 (2022)
[4] Bowesman *et al.*, J. Quant. Spectrosc. Radiat. Transf., 289, 108295 (2022)

p-number: p111 **Submitted on Tue, 13 Jun 2023 20:45:49 +0200**