The CW-CRDS spectrum of ^{17}O enriched water between 5850 and 6670 cm^{-1} : more than 700 newly determined energy levels of $H_2{}^{17}O$ and $HD^{17}O$

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The absorption spectrum of a ^{17}O enriched water vapour sample has been recorded by cw-CRDS spectroscopy at pressure of 1 and 12 Torr. The noise equivalent absorption of the recordings was on the order of $\alpha_{min} \sim 5\times10^{-11}$ cm^{-1}). More than 8500 water lines with intensities ranging between 2.3×10^{-30} and 8.4×10^{-25} cm/molecule at 296 K were measured in the 5850 – 6670 cm^{-1} region. Absorption lines of six water isotopologues ($H_2{}^{16}O$, $H_2{}^{18}O$, $H_2{}^{17}O$, $HD^{16}O$, $HD^{18}O$ and HD17O) were assigned. The rotation-vibration assignment was performed on the basis of the variational line lists [1] based on the results of Partridge and Schwenke [2, 3] and of previously determined energy levels [4-7]. More than 570 rotational levels belonging to 13 vibrational states of $H_2{}^{17}O$ and about 170 rotational levels of six states of $HD^{17}O$ were determined for the first time. The validation of the assignment results was made using the RITZ program [8]. The obtained sets of $H_2{}^{17}O$ and $HD^{17}O$ energy levels are compared with the available calculated and experimental data.

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1. http://spectra.iao.ru/1280x622/en/mol/survey/1/
2. H. Partridge, D.W. Schwenke, *J. Chem. Phys.* **106**, 4618-4639 (1997)
3. D.W. Schwenke, H. Partridge, *J. Chem. Phys.* **113**, 6592-6597 (2000)
4. J. Tennyson et al., *JQSRT,* **110**, 573-596 (2009)
5. J. Tennyson et al., *JQSRT*, **111**, 2160-2184 (2010)
6. S. Mikhailenko et al., *JQSRT*, **113**, 653-669 (2012)
7. J. Tennyson et al., *JQSRT*, **117**, 29-58 (2013)
8. S. Mikhailenko et al. *JQSRT*, **110**, 597-608 (2009)