EXPERIMENTAL WORK ON WATER IN TOMSK

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Experimental investigations of water vapor absorption spectra at the Institute of Atmospheric Optics are performed using high sensitive Intracavity Laser Spectrometers and Grating Spectrophotometers in high frequency region 9000 – 14000 cm^{-1}. This region is occupied by transitions to high resonance polyads involving three or more vibrational quanta. Corresponding energy levels lie near or above barrier to linearity – saddle point on the potential energy surface, which determines in a great extend the vibration – rotation dynamics in the XH_2 – type molecules.

The high temperature water vapour absorption spectra measurements

Measurements of the high temperature water vapour absorption spectra (up to T=800 K) in the region of 10000 – 16000 cm^{-1} will be made using grating spectrometer.

Parameters of the spectrometer:

Focal length	2600 cm
Spectral resolution	0.03 cm^{-1}
Absorption pathlength	1-2 m

Measurements of line position and strengths, lines broadening and shifting coefficients are producing at the spectral resolution 0.03 cm^{-1} and at different sample pressures. The main advantage is the use of the diode array detector of high sensitivity that allows reaching the high signal – to – noise ratio from 1000 to 5000 depending on wavelength.

Intracavity laser spectrometers

The H_2O absorption spectra measurements are performed using Intracavity laser spectrometers operating in the region upper 8500 cm^{-1}.

Lasers for ICL-spectroscopy:

1. Nd-glass (9200-9520 cm^{-1})
2. Color center in LiF (10600-11200 cm^{-1})
3. Ti:Sapphire (11300-12800 cm^{-1})

Lasers have pulse duration 25-2000 microseconds that allow getting high threshold sensitivity to absorption.

The measurements will be made at spectral resolution 0.03 cm^{-1} and effective path length up to 10 km. Spectra of the $H_2{}^{16}O$, HDO, D_2O and $H_2{}^{18}O$ isotopomers will be recorded at elevated temperatures, up to 800 K and sample pressures up to 100 Torr.