

## **Spectrophotometric analysis of iodine vapour by Techcomp UV2600 UV/Vis spectrophotometer**



## **Scope**

The electronic spectra of small molecules in the gaseous state often reveal many molecular rotation and vibration lines. The analysis of these spectra can give a lot of molecular structure information and the potential energy curve of the ground state and excited electronic state. The visible absorption spectrum of iodine molecular vapour in the 500 nm-650 nm range is always a good example.

As the resolution of the UV-Vis spectrophotometer increases, this spectral structures will show up. In this experiment, we use the Techcomp UV2600 ultraviolet-visible spectrophotometer. We can change the resolution of the instrument by changing the slit width of the instrument, and do the visible absorption spectrum scan of iodine vapour.

## **Instrument**

Techcomp UV2600 UV/Vis spectrophotometer

Cuvette : optical quartz cuvette (190-2500nm), dimension : 45×12.5×102.5mm (H×W×D), length path : 100mm



## **Reagent and material**

Iodine (solid)



## **Test protocol**

Add a small amount of solid iodine to the cuvette, seal the cuvette, and then heat it with a hot dryer for 5 minutes. The cuvette is filled with iodine vapour and put inside the sample compartment of UV2600. Change the slit width of the instrument from 0.1 nm to 0.2 nm, 0.5 nm, 1.0 nm, 2.0 nm, 5.0 nm d in sequence, and other parameters are tested consistently.

## **Instrumentation parameters**

Test mode: Wavelength scan

Data mode: ABS

Start wavelength : 650 nm

End wavelength : 500nm

Scanning speed : 20 nm/min

Interval: 0.05

## Experimental result and discussion

Absorption spectra of iodine vapour under different slit widths:

Figure 1 : Absorption spectrum of iodine vapour at 0.1nm slit width

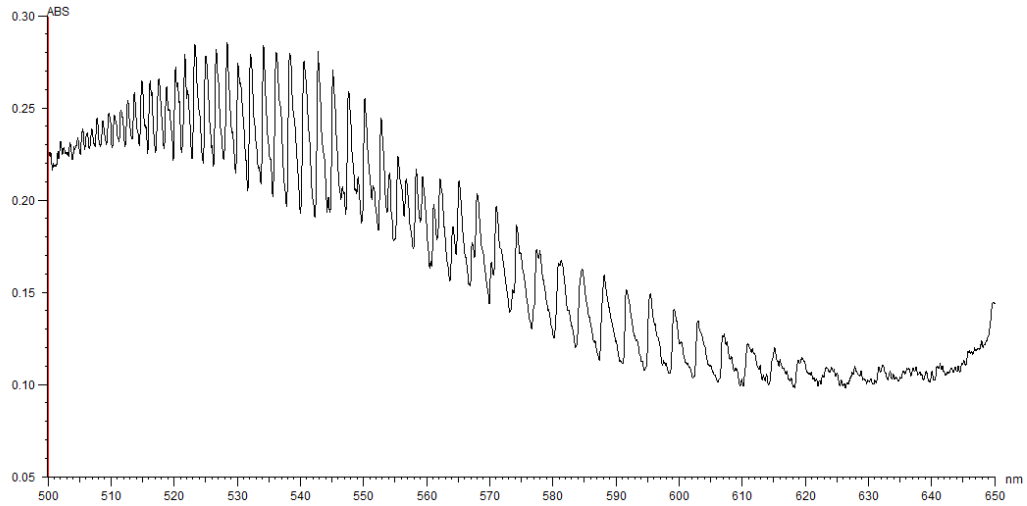


Figure 2 : Absorption spectrum of iodine vapour at 0.2nm slit width

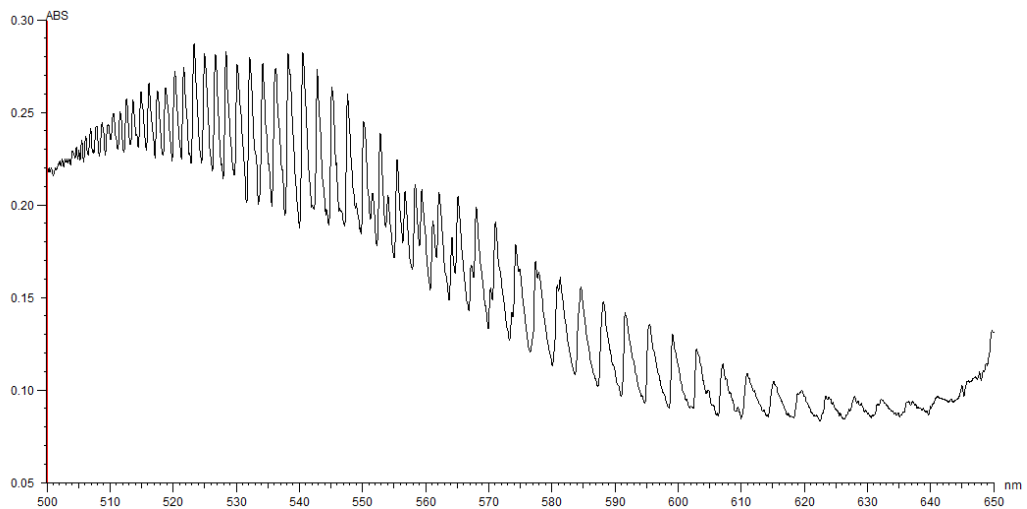


Figure 3 : Absorption spectrum of iodine vapour at 0.5nm slit width

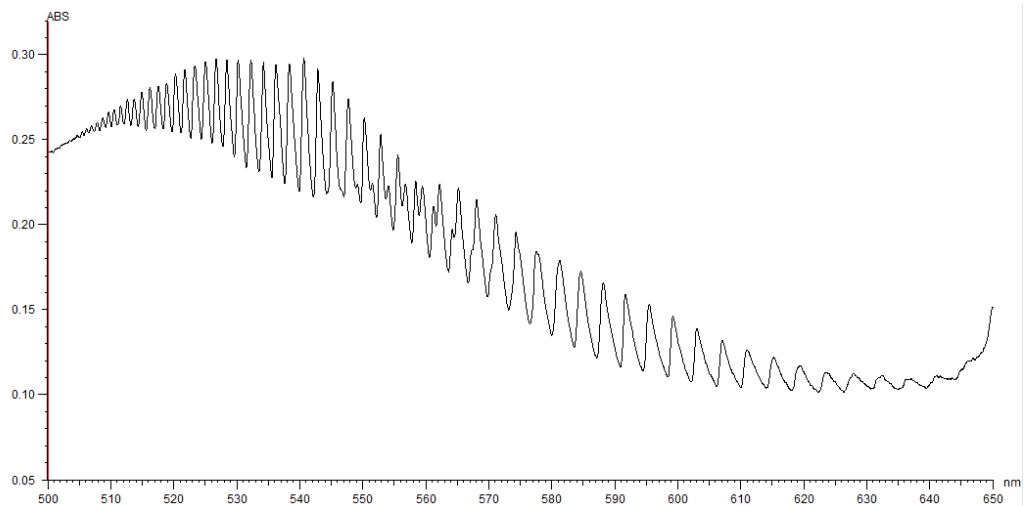


Figure 4 : Absorption spectrum of iodine vapour at 1.0nm slit width

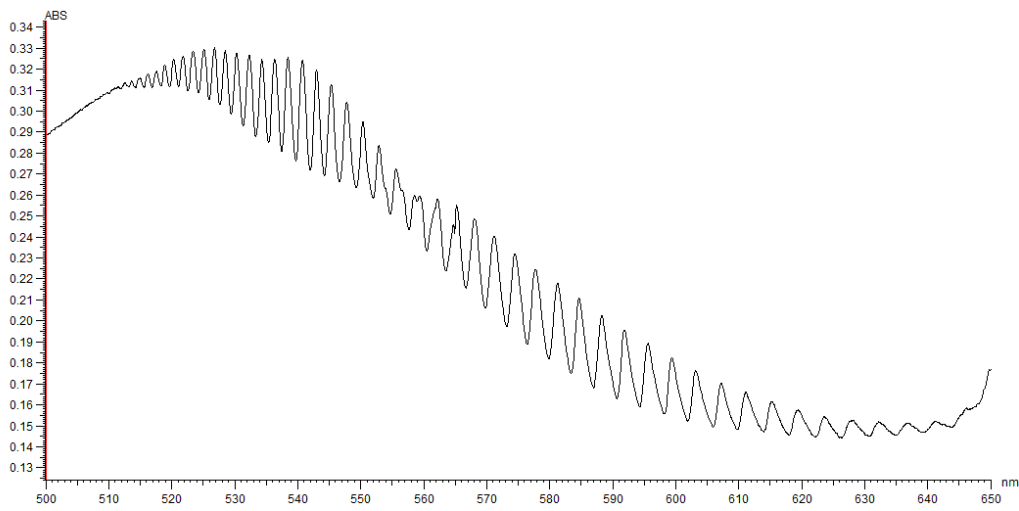


Figure 5 : Absorption spectrum of iodine vapour at 2.0nm slit width

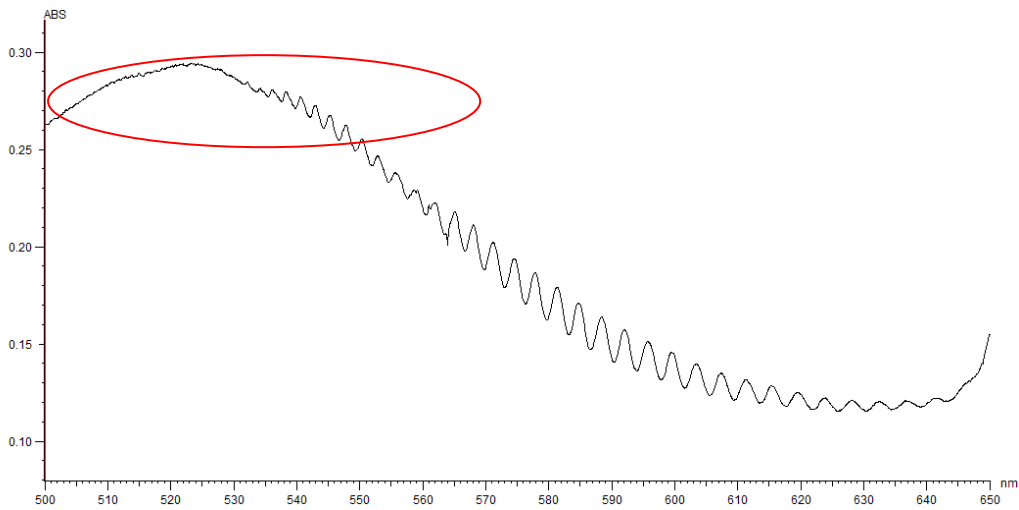


Figure 6 : Absorption spectrum of iodine vapour at 5.0nm slit width

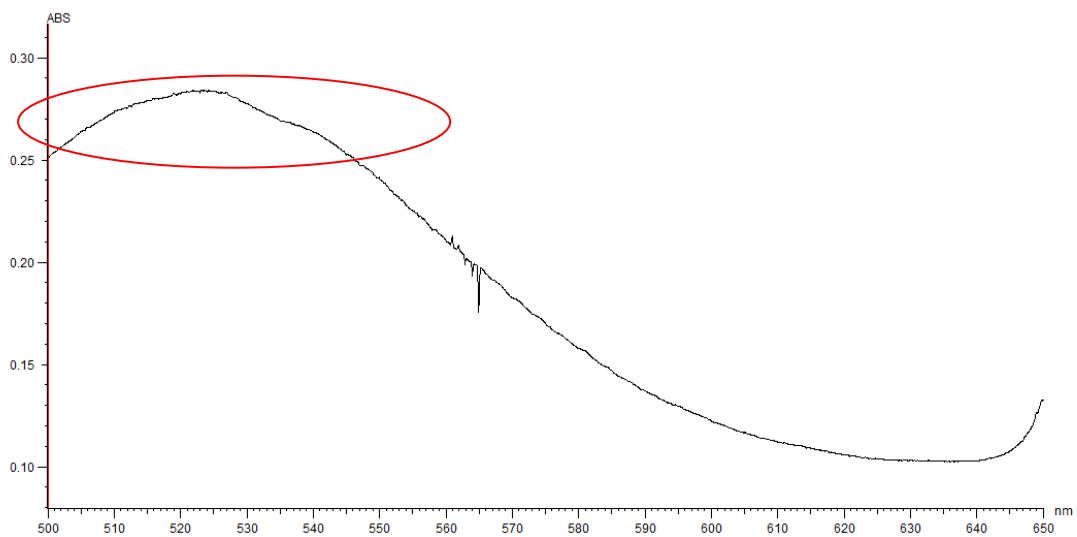


Figure 7 : Comparison of iodine vapor spectra in the range of 500 - 520nm under different slit widths

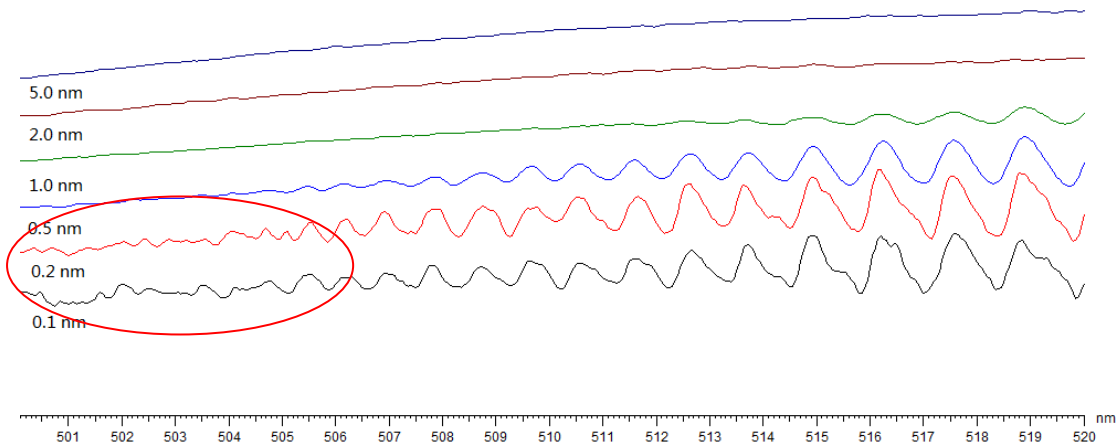


Figure 8 : Comparison of the iodine vapour spectra under the slit width of 0.1 nm and 1.0 nm

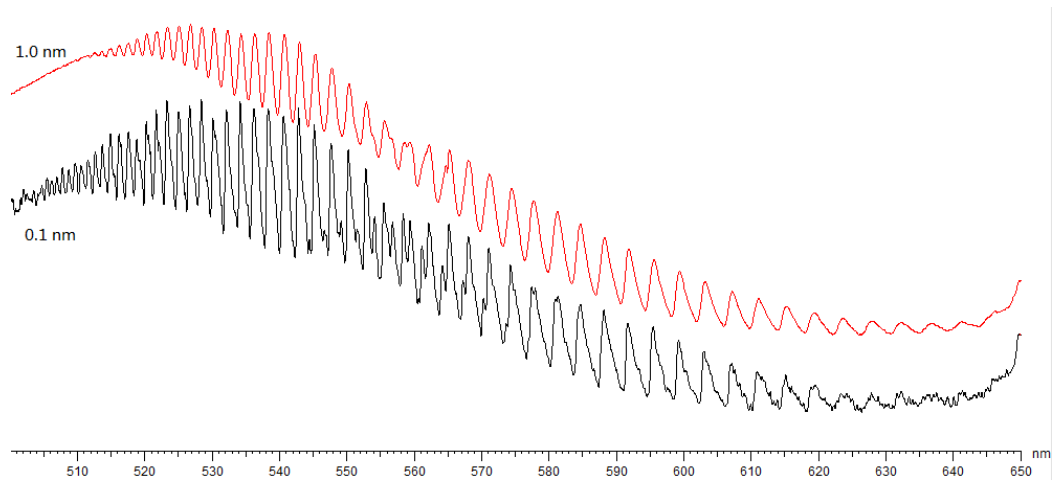
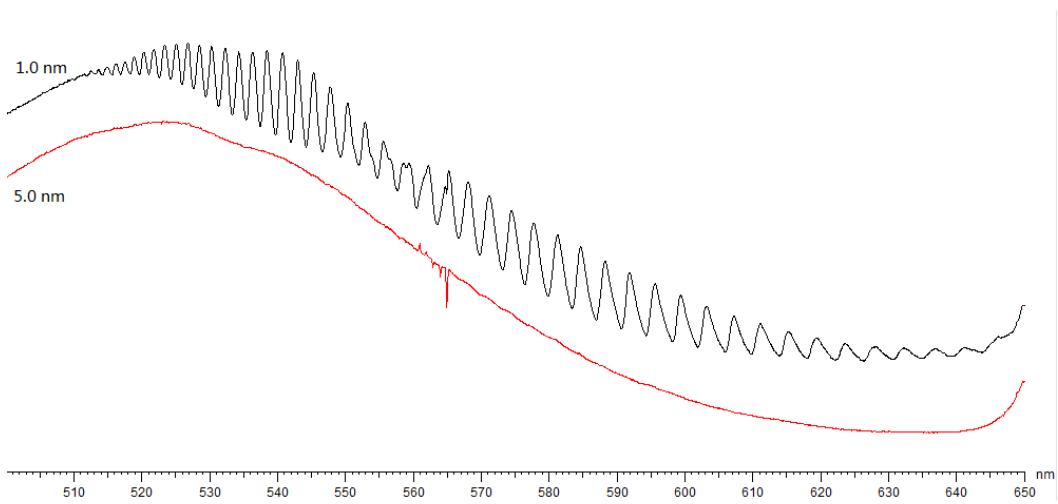


Figure 9 : Comparison of the iodine vapour spectra under 1 nm and 5 nm slit width



**Conclusion :**

The absorption spectrum of iodine vapour under each slit width is shown in Figure 1-6. From the experimental results, we compare and overlay the iodine vapour spectra (500-520 nm) under different slit widths as shown in Figure 7. The vibration amplitude of the iodine vapour spectrum is obviously weakened by increasing of the slit width. A very clear vibration band can be seen in the range of 500 nm-520 nm under the slit width of 0.1 nm. The vibration amplitude is slightly weakened at 0.2 nm slit width. When the slit width increases to 2.0 nm, the vibration in the 500 nm-520 range has not been detected. Consequently, the vibration amplitudes of the overall vibration bands of 0.5 nm, 1.0 nm, and 2.0 nm gradually weaken by increasing the slit width. Until the slit width increases to 5 nm (as shown in Figure 6), there is no vibration in the scanning range.

As a summary, we can characterize the special structure of the iodine vapour under high resolution test conditions. The change of spectral bandwidth which is proved, and bring different resolution effects by Techcomp UV2600.