UV Fourier transform absorption cross sections of benzene, toluene, ortho-, meta-, and para-xylene

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SUMMARY

WHAT? Temperature and pressure effects on the absorption cross sections of BTX in the 35000-42000 cm⁻¹ (286-238 nm) range
HOW? A Fourier transform spectrometer coupled to a 10 cm cell → Pure BTX & BTX+air mixtures spectra @ 253, 263, 273, 283, and 293 K.

EXPERIMENTAL

Experimental conditions
Spectral range 30000-42000 cm⁻¹
Resolution 1.0 cm⁻¹
Absorption path length 10 cm
Temperature 253, 263, 273, 283, 293 K
BTX pressure 0.5 - 5 hPa
Dry air pressure 5 - 55 hPa
Lamp & detector Xe & UV diode
Co-added scans 10 x 64

Data processing
Blanks recorded before and after BTX measurement
Spectra of pure BTX at each temperature with different pressures
Spectra of mixtures of BTX with dry air at different total pressures at each temperature
Cross sections calculated using

\[
\sigma_{\nu} = \frac{1}{M_2} \frac{\Delta M_2}{\Delta \nu} \frac{\Delta \nu_2}{\Delta \nu_1}
\]

TOluene
Comparison of toluene absorption cross section at 293 K with values from the literature
Large differences with literature data

XYlenes
Comparison of m-xylene absorption cross section at 293 K with values from the literature
Large differences with literature data
Good agreement with Etzkorn et al.

Temperature effect on the toluene absorption cross section
As expected, when T increases, intensity of peaks decrease

Temperature effect on the m-xylene absorption cross section
Reverse temperature effect than expected
But bad SNR due to very low pressure at low T

Pressure effect on the benzene absorption cross section
Small temperature effect affecting mainly the peak intensity

Pressure effect on the benzene absorption cross section
Visible pressure effect with respect to buffer gas pressures

CONCLUSIONS
High resolution absorption cross sections of BTX
Temperature and pressure effect different for each species
Large differences with literature data