

CONTINUOUS MONITORING OF CHLORINE CONCENTRATION BY A UV/VIS DIODE ARRAY SPECTROPHOTOMETER

Numerous chemical processes benefit from accurate monitoring of chlorine gas. In most cases other chlorinated components are present in the stream as well and it is often useful to utilize the same instrument to measure the concentration of chlorine from low levels (ppm range) to the high percent levels. The OMA, being a full spectrum high resolution analyzer, is an ideal analyzer for these applications.

Low levels of chlorine gas

When measuring low levels of chlorine the absorbances are usually very low and an analyzer with a high signal to noise ratio is essential. The OMA, a UV/VIS diode array spectrophotometer, measuring a complete spectrum from 190nm to 800 nm with 1nm resolution and an accuracy of $\pm 0.002\text{AU}$, was applied to this application. The chlorine concentration in the gas phase was measured down to 1ppm (in liquids 1ppm $\pm 0.1\text{ppm}$.)

High and low levels of chlorine using the same analyzer

Many applications require a continuous measurement of chlorine from low levels (ppm range) to the high percent levels. A filter based spectrometer can not be used since the signal will either be saturated at high Cl_2 concentration or the signal will be too low for detection at the lower concentration range. However, when utilizing the OMA-300, a full spectrum analyzer, it is feasible to cover the complete dynamic range since the OMA-300 allows for both low and high level chlorine streams to be measured at various wavelengths with the same analyzer. The spectrum is measured continuously and analyzed to give the chlorine concentration. If the absorbance is above a cer-



tain threshold value, a new evaluation method is loaded automatically using a new set of standards and wavelengths for analyses. For example, in figure 2, three spectra are shown: the 800ppm Cl_2 can be measured at the 300-350nm range, the 8% chlorine can be measured at 400-440nm range, and so on, covering the entire range. Since the evaluation methods are different for the various concentration ranges, the accuracy of measurement is maintained at any stream composition.

Figure 1: Absorbance spectrum of 1ppm Cl_2 gas

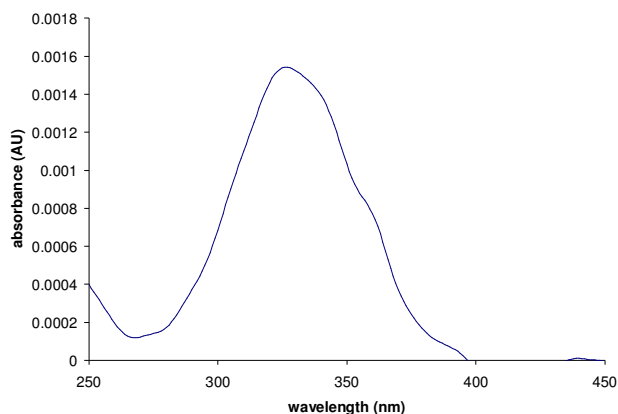


Figure 2: Absorbance spectra of Cl_2 gas.

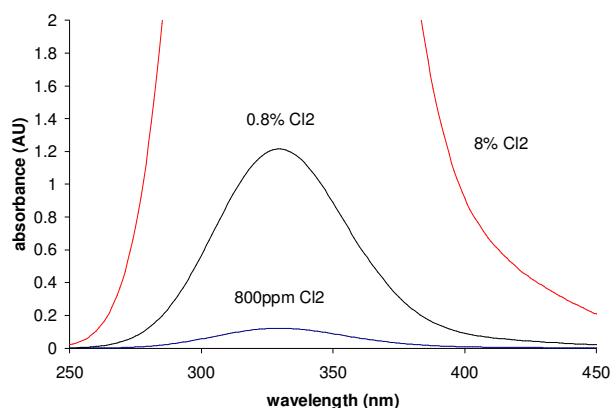


Figure 3: Absorbance spectra of NCl_3 and Chlorine (low Cl_2 high NCl_3 levels)

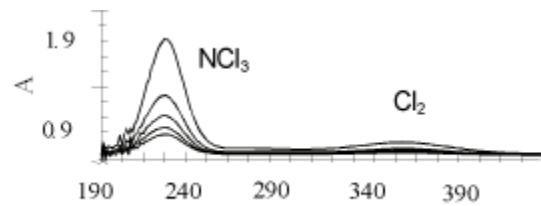
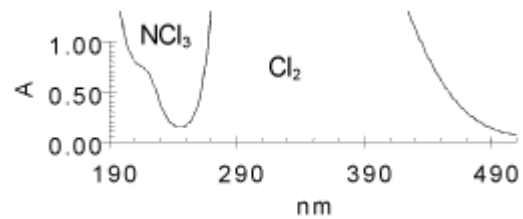


Figure 4: Absorbance spectra of NCl_3 and Chlorine (high Cl_2 low NCl_3 levels)



Interfering components:

An important feature of the OMA-300 is its ability to handle gas and liquid mixtures with interfering spectral features. For example figure 3 and 4 shows the absorbance spectra of Cl_2 and NCl_3 . By measuring a complete UV/Vis spectrum and applying a multi components evaluation analysis, the concentration of both components are continuously monitored.

Features

- Accurate measurements of low level chlorine.
- High dynamic range; high and low levels of Cl_2 with the same analyzer
- Multi components--can measure Cl_2 in the presence of interfering components
- Fiber optics option is available, separating the sample from the electronics.
- Variety of flow cells depending on applications and varying in design, dimensions and constructing materials
- Modular design and very low maintenance
- Industry standard 4-20mA outputs, as well as networking software and hardware, are included
- For straight forward applications the OMA-300, a lower cost unit, is recommended



29 Domino Drive
Concord, MA 01742
Tel: 978-287-4222
Fax: 978-287-5222
e-mail: sales@a-a-inc.com
web: www.a-a-inc.com

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