Measuring Metal Ions

Applied Analytics Application Note No. AN-016

Application Summary

Analytes: copper (Cu^{2+}), nickel (Ni^{2+}), chromium (Cr^{6+}), iron (Fe^{2+}), cobalt (Co^{2+})

Detector: OMA-300 Process Analyzer

Introduction

From mining to electroplating, a wide range of processes require online monitoring of metal ions in solution. A major application is analysis of metal ion concentrations in wastewater for environmental reasons and for regulation of water treatment processing.

The traditional lab method for measuring metal ions uses atomic absorption spectroscopy, which comes with slow results, expensive instrumentation, and human involvement.

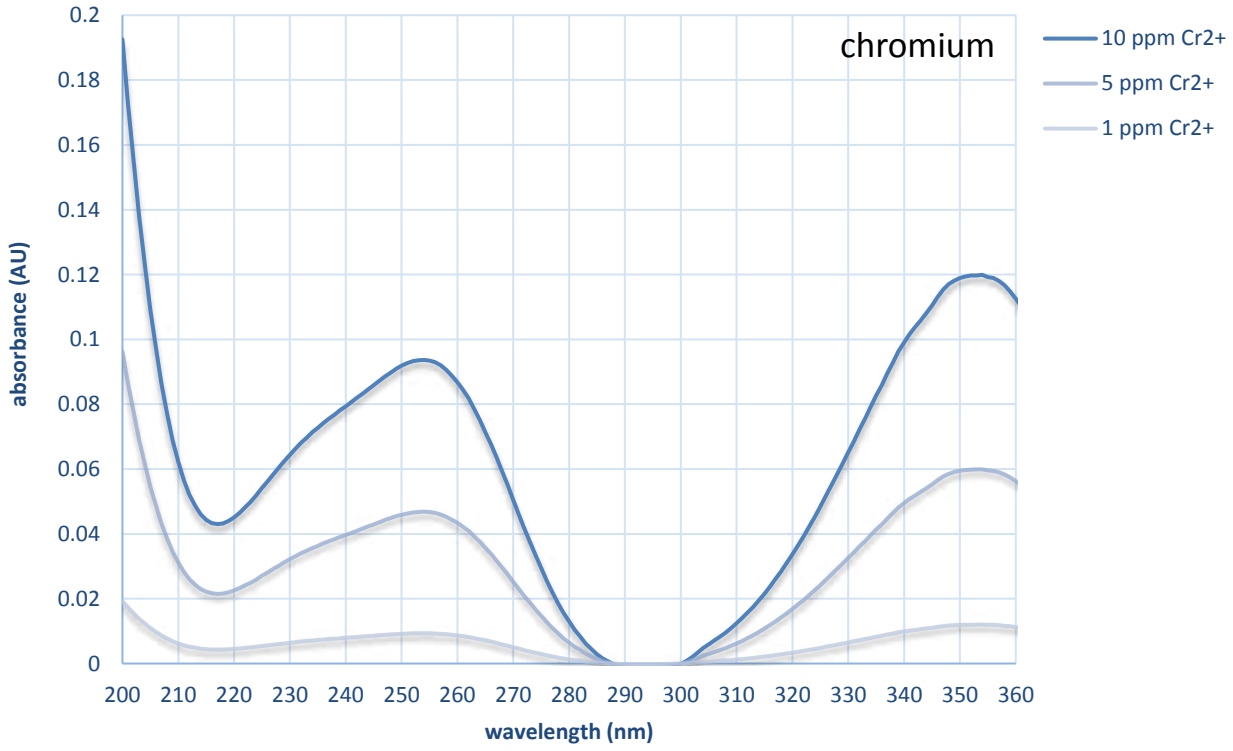
The OMA system provides always-online analysis of trace-to-high metal ion concentrations at the site. This fully automated solution provides real-time response for tighter process control. The flexibility of full-spectrum analysis allows the user to add/remove metal ion measurements or modify measurement ranges at any time.

OMA Benefits

- Continuously measures metal ion concentrations (up to 5 analytes) using dispersive UV-Vis/SW-NIR spectroscopy
- Totally solid state build with no moving parts — modern design for low maintenance
- Ultra-safe fiber optic design with dedicated sample flow cell — no toxic/corrosive sample fluid in analyzer enclosure
- Excellent dynamic range due to photodiode array — no error due to absorbance saturation
- Decades of field-proven performance in industrial and environmental applications
- Also available in portable suitcase version for analysis at multiple sites

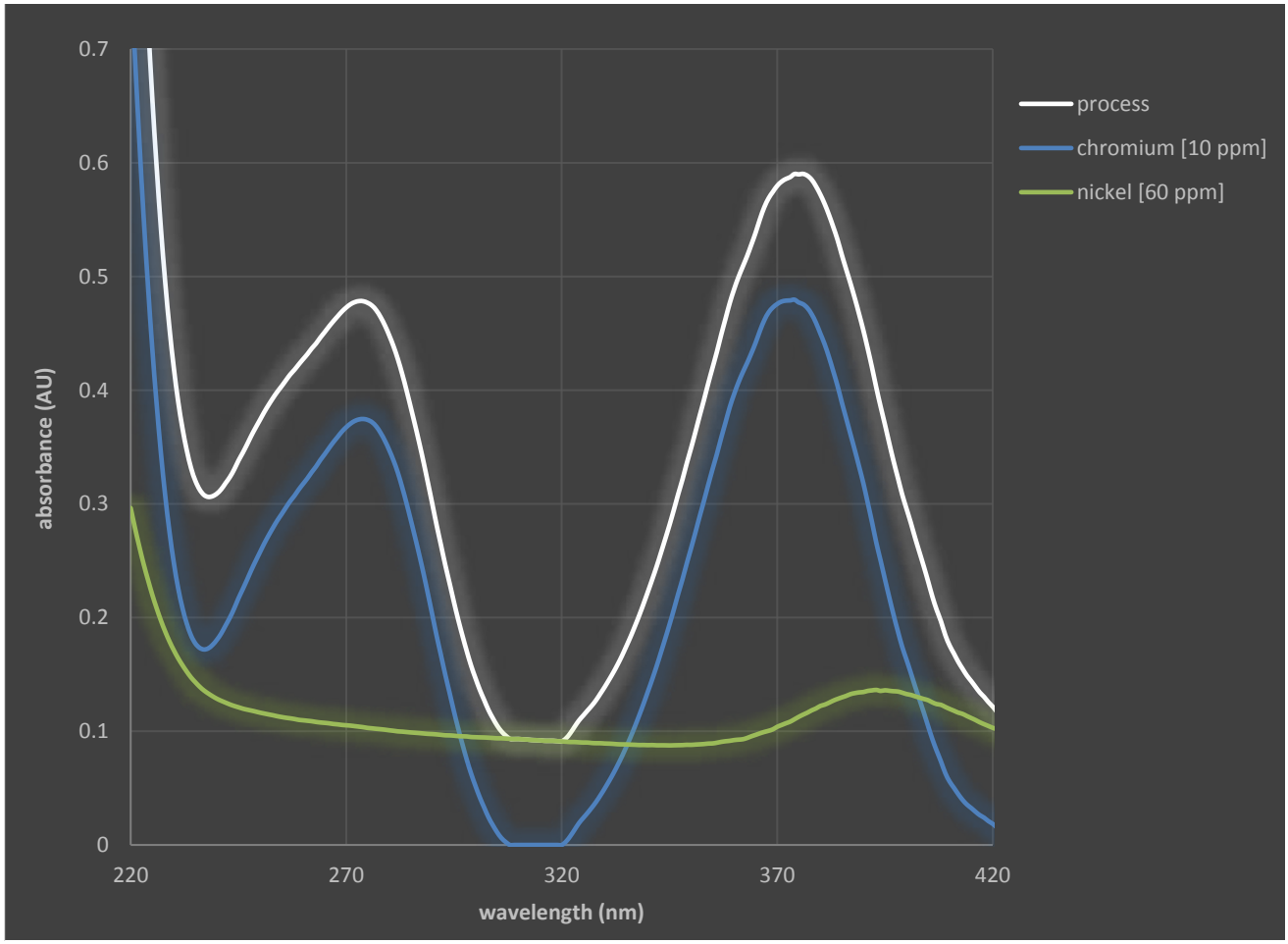
Absorbance-to-Concentration Correlation

The OMA system is calibrated on standard samples (known concentrations) of each analyte in order to learn the distinctive absorbance curve of each analyte. This concept is illustrated below with the chromium ion absorbance spectra:



Simultaneous Analysis of Multiple Metal Ions

The OMA system uses a multi-component analysis algorithm which harvests the rich data of dispersive spectrophotometry in order to easily measure multiple analytes with overlapping absorbance curves. The absorbance measurements at each integer wavelength feed into a matrix of equations continuously solved by the proprietary ECLIPSE software; the absorbance curve of each analyte is de-convoluted from the total sample absorbance.



In the figure above, each dot in the process curve represents a single absorbance data point supplied by a photodiode measuring at an integer wavelength. Compiling this rich raw data, the OMA visualizes the total absorbance curve and deconvolutes the absorbance of each metal ion.

The specifications below represent performance of the OMA-300 Process Analyzer in a typical metal ions application.

For technical details about the OMA-300 Process Analyzer, see the data sheet:
http://aai.solutions/documents/AA_DS001A_OMA300.pdf

All performance specifications are subject to the assumption that the sample conditioning system and unit installation are approved by Applied Analytics. For any other arrangement, please inquire directly with Sales.

Application Data		
Performance Specifications		
Accuracy	*Custom measurement ranges available; example ranges below.*	
	chromium ion	0-100 ppm: ±1 ppm
	copper ion	0-100 ppm: ±1 ppm
	nickel ion	0-100 ppm: ±1 ppm
	iron ion	0-100 ppm: ±1 ppm
	cobalt ion	0-100 ppm: ±1 ppm
		*Whichever is larger.

Further Reading

Subject	Location
OMA-300 Process Analyzer Data sheet	http://aai.solutions/documents/AA_DS001A_OMA300.pdf
Advantage of Collateral Data Technical Note	http://aai.solutions/documents/AA_TN-202_CollateralData.pdf
Multi-Component Analysis Technical Note	http://aai.solutions/documents/AA_TN-203_MultiComponentAnalysis.pdf

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