APPLICATION BRIEF

Samsung Austin Semiconductor Improves Safety and Quality of Measurements for Copper Wastewater Streams

The semiconductor industry has found that traditional analytical methods for complexed copper in wastewater are not fit for purpose. For instance, complexed copper cannot be accurately measured using ion-selective electrodes and colorimetry technology, while accurate, has significant challenges.

The critical issues of colorimetry include concerns about safety, quality of analysis, and system reliability (uptime). Safety is a primary concern because the Bicinchoninate Method requires using a bicin solution containing ammonium hydroxide, which necessitates the use of fume hoods and tightly sealed containers for safe handling. Additionally, colorimetry systems can have more than 40 potential failure points, negatively impacting analyzer uptime and significantly increasing maintenance burdens and associated costs. Furthermore, ownership costs are further increased as sample times are reduced (i.e., 45 minutes to 30 minutes). Lastly, if the precursors used to create bicin solutions are in global shortage, end-users of colorimetry technology for copper wastewater analysis could face disruptions.

Give these challenges, Samsung Austin Semiconductor (SAS) explored an alternative analytical method for complexed copper in wastewater based on Direct Voltammetry—AMS's MetalGuard™ analyzer. The electroanalytical method of Direct Voltammetry is a concept that is well suited to provide unattended automated trace metal analysis field units. It has outstanding sensitivity and allows for speciation of multivalent metal ions without requiring additional sample preparation.

In addition, the MetalGuard analyzer has demonstrated a high sensitivity to copper species while maintaining a robust and stable design. The analytical approach employs a sensor self-generation mechanism making the probe (Meniscus electrode) less prone to gradual contamination from impurities or byproducts of the electrochemical process. As a result, the instrument can maintain its sensitivity (0.05 ppm) and calibrated status for an unlimited timeframe while operating reliably regardless of sample matrix conditions. The system is fully automated, with typical measurement time ranging from 20-30 minutes.

SAS conducted two 90-day tests to evaluate the MetalGuard analyzer's performance and its ability to significantly improve safety and quality of measurements for copper wastewater streams. Since the instrument measures two distinct waste streams within a single unit, SAS was able to reduce the total number of analyzers on-site from four to two. SAS also realized additional cost reductions because of the analyzer's low reagent and consumable use. Further operational savings at SAS resulted from this novel analyzer's automation and self-calibration. And most importantly, the MetalGuard technology supported the industrial wastewater treatment vision at SAS; safely treat and dispose of waste with quality standards encompassing the most environmental, economic, and adaptable methods.

Semiconductor facilities and other industrial users struggling to find a safe, reliable, and effective method to measure complexed copper in wastewater will benefit from evaluating the online MetalGuard analyzer for their analytical needs.

MetalGuard™ Duo Analyzer

- Designed for monitoring Hi-Low streams with 100% redundancy
- Limits of detection and ranges
  - 1-100 ppb; 50 ppb–1,000 ppb; 1,000 ppb–50,000 ppb
- Accuracy and repeatability ± 1 ppb for lower range
  - Self-regenerated sensor with virtually unlimited lifetime
  - Sensor self-calibration in each measurement cycle
- Small footprint
- Low maintenance—3-month cycle
- High throughput—up to 50 samples per day
- Up to six independent streams
- Versatile sample preparation
- Flexible communication and self-monitoring options
- Non-toxic reagents

a: 1225 E. Arques Avenue, Sunnyvale, CA 94085 | t: +1 (408) 523-1900
e: info@ams-h2o.com | w: ams-h2o.com