



information

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Press Release

Air Liquide's Balazs Analytical Services announces three new tests for speciation of Total Oxidizable Carbon in Ultra-Pure Water

Balazs Analytical Services, a division of Air Liquide Electronics U.S. LP, announces three new tests for **Total Oxidizable Carbon (TOC) speciation** in ultra-pure water (UPW). The three new tests – for urea, resin amines (trimethylamine and tetramethylammonium) and organic acids, – allow for greater understanding of TOC contributors.

Commonly, TOC is tested in UPW systems using on-line monitors. However, the results are inconclusive concerning the specific compounds contributing to TOC levels. Speciation of organic molecules is beneficial because urea, resin amines and organic acids affect semiconductor processes at different contamination levels. The results of these tests allow system engineers to take specific actions to reduce TOC and keep the UPW system in control.

Rich Jahr, president of Air Liquide Electronics U.S. LP, added, ***“As technology nodes decrease, previously acceptable levels of TOC contamination in UPW are now impacting manufacturing processes. Balazs is actively involved in establishing new industry guidelines and methods to the industry's technology advancement.”***

The presence of **urea** is concerning because typical fab systems cannot remove it from UPW or cleanroom air humidified with contaminated water. Each molecule of urea has the potential to travel to the wafer environment and generate two molecules of ammonia. The ammonia can then interfere with acid-catalyzed photoresist and cause T-topping and CD (critical dimension) shifts. Sourced in incoming city water, urea levels fluctuate over time due to many factors affecting agricultural run off, including agricultural usage, and rainfall patterns.

As bases, resin **amines** also have the capacity to interfere with acid-catalyzed photoresist. Anion exchange resin is the most significant source of resin amines, followed by tetramethylammonium hydroxide (TMAH) occurring in reclaim water.

Speciation of TOC indicating increased levels of **organic acids** provide assurance that something more serious is not going on with a UPW system. Generally, processes can tolerate higher levels of TOC when organic acids are the source. Organic acids include acetate, formate, glycolate, lactate, propionate, pyruvate, butyrate, malate, tartrate, oxalate, and citrate. Potential sources include incoming city water, 185nm ultra-violet reduction of larger organic molecules, and reclaim water.

Alexandre Trembot, general manager of Balazs Analytical Services, stated, ***“The challenges in UPW systems are the fluctuations in source water contamination and the need for lower detection limits of various TOC compounds. Our advancements in TOC testing provide the specific data needed to proactively optimize UPW systems”***

TOC speciation testing is offered through Balazs' ISO 17025 certified laboratories and available to customers worldwide.

Balazs Analytical Services, a division of Air Liquide Electronics U.S. LP, operates ISO 17025 certified laboratories that specialize in identifying ultra-low level contamination. Balazs' expertise covers solids, liquids and gases used in the electronics and other high-tech industries. With every analysis, Balazs brings over 30 years of experience to help engineers control their process. Balazs laboratories are located in Dallas, TX; Fremont, CA; Fishkill, NY; and Paris, France.

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which are consistent with Air Liquide's commitment to **sustainable development**, help to protect life and enable our customers to manufacture many indispensable everyday products. Founded in 1902, Air Liquide has nearly 36,000 employees. The Group has successfully developed a long-term relationship with its shareholders built on **trust and transparency** and guided by the principles of **corporate governance**. Since the publication of its first consolidated financial statements in 1971, Air Liquide has posted **strong and steady earnings growth**. Sales in 2005 totalled 10,435 million euros, with sales outside France accounting for almost 80%. Air Liquide is listed on the Paris stock exchange and is a component of the CAC 40 and Eurostoxx 50 indices (ISIN code FR 0000120073).

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