

SEMICONDUCTOR & ELECTRONICS



ICS-3000 Solutions for the Semiconductor and Electronics Industries

Water and pure chemicals are key resources for the semiconductor and electronics markets. Many factors are influencing the need for advanced instrumentation to optimize the research and manufacturing of products for these two industries. Some of these factors are outlined below.

Increasing Complexity of Electronics

With the advent of smaller line width devices and more complex electronic content of printed circuit boards, higher purity standards for water and other chemicals are being considered. Today, parts per billion (ppb, $\mu\text{g/L}$) or trillion (ppt, ng/L) is the standard with many companies viewing the possibility of even lower standards as a requirement within the next 10 years or sooner.

Requirements for Interconnect Performance and Manufacturability

Advanced materials such as custom plating baths, high purity acids and solvents, or even specialty CMP chemical all require testing for ionic contamination and quality assurance. More importantly, safety-critical applications require instrumentation with greater reliability than ever before for determining contamination in plating baths and for quality assurance.

Reliable Analysis

The ICS-3000 represents the next generation ion chromatography system. Designed exclusively for the analytical challenges found in the semiconductor and electronics industry, this is the system you have been asking for. The ICS-3000 has superior sensitivity, robustness, serviceability, and reproducibility. Each module uses advanced electronics that improve detection and enhance separation. Continuing Dionex's leadership in chromatographic technology, we have expanded the capabilities of our Reagent-Free™ IC (RFIC™) systems to solve the complex problems you encounter in producing high technology products.

Ionic Contamination

Common sources of ionic contamination include rinsing, etching, plating, masks, moisture, human contamination (such as oils from fingerprints), component packaging materials, flux from solder paste and residues from misprinted boards, air and gases, and machine or tool contamination. The ICS-3000 is designed to help determine contamination in your manufacturing process.



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- In another configuration, the system is preplumbed to switch between two separate analyses using one autosampler, two pumps operating at different flow rates, two columns and suppressors, and two detectors.

With only one autosampler, you can run one sample and obtain results for both anions and cations or perhaps run two methods with one IC system, improving productivity and saving bench space. The flexibility of the ICS-3000 increases productivity and provides fast results for time-sensitive production requirements.

The ICS-3000 pumps are stackable dual, inert pumps with easy access slide-out trays. Ion chromatography often requires a second independent pump for a variety of reasons:

- sample preconcentration of contaminants in ultrapure water,
- matrix elimination
- postcolumn reagents
- suppression of external water delivery addition
- a spare pump if the primary fails
- clean consumables
- quick start procedures

For a minimal cost, you can take advantage of a second pump.

Preconcentration of Trace Contaminants in Ultrapure Water

In the past, preconcentration, matrix elimination, and postcolumn reagent techniques required a maze of pumps, tubing and external devices. With the ICS-3000, one compact system delivers preconcentration for trace analysis of pure water, matrix elimination for trace analysis of chemicals, and postcolumn reagent techniques for trace analysis of transition metals. Figure 3 demonstrates a typical transition metal analysis using the ICS-3000 with both preconcentration (A) and large-loop injection (B).

Streamline Your Cation Methods

Cation-exchange IC methods are also made easier using RFIC systems

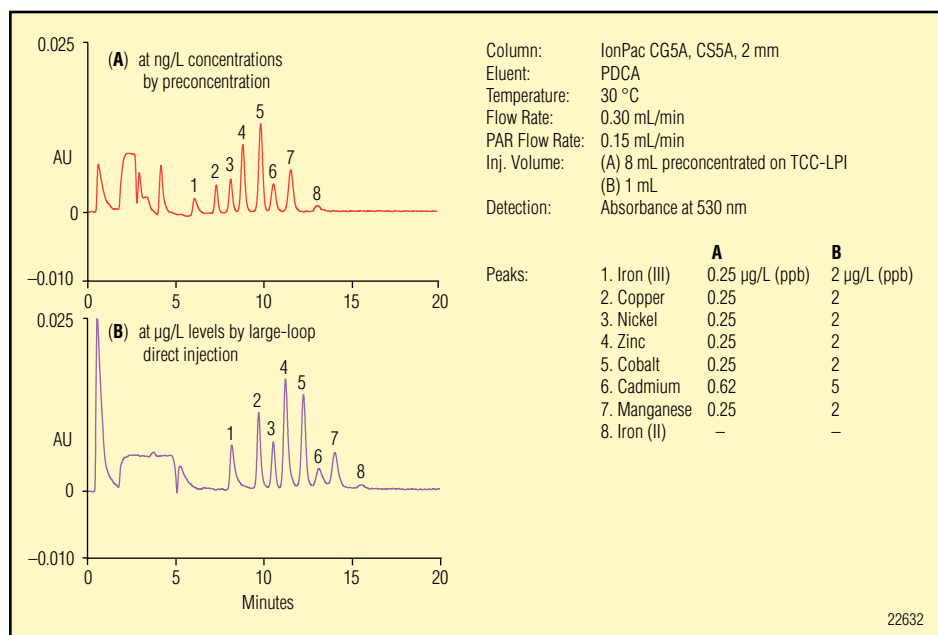


Figure 3. Determination of transition metals using the ICS-3000 with preconcentration and large-loop injection.

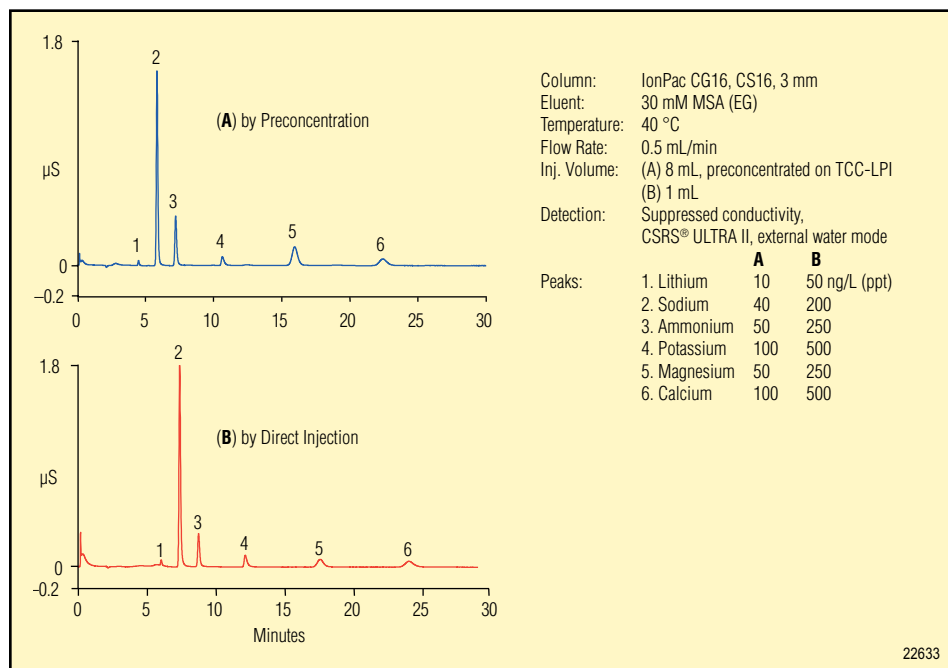


Figure 4. Determination of cations at ppt concentrations in high purity water using the ICS-3000 with both preconcentration and large-loop injection.

with cation-exchange columns. The MSA eluent used with the IonPac CS16 column is easy to program into the application method and allows isocratic separation of Group I and Group II cations and ammonium. These cations are important analytes for semiconduc-

tor and electronics analysis of pure water, chemicals, cleanliness testing of cleanroom materials, and cleanroom air. Figure 4 demonstrates the capability of the ICS-3000 for low-level cations using preconcentration (A) or large-loop injection (B) with the IonPac CS16 column.

Compare Analysis Methods

Ever wondered if a different column or eluent concentration might improve your analysis? Now you can directly compare columns or eluents, side by side on one system. With the ICS-3000 dual system, inject one sample at the same time, and directly compare which column or eluent works best for your application. The possibilities are endless, now you can improvise and try new applications with ease.

Turn Trace Analysis into Routine Analysis

Eluent generation makes trace-level analysis of anions and cations routine. The ultrapure hydroxide produced by the EGC II KOH cartridge results in a low, stable baseline that makes integration easier. Using the EG with the CR-TC trap columns minimizes baseline shift during the step changes or gradients. For cation determinations, the EGC II MSA cartridge delivers ultrapure MSA for a low, stable baseline and reproducible retention times.

For most IC applications, eluent generation is simply a better solution. Consider these advantages:

- **Savings:** Instead of manually preparing eluents, you simply supply your system with deionized water and proceed with your analyses. Each EluGen® cartridge lasts 6–12 months under typical usage conditions, and changing a cartridge takes only a few minutes.
- **Consistency:** By eliminating variability associated with manual eluent preparation, and by eliminating the possibility

of eluent contamination, eluent generation delivers reproducible results, day to day, week to week, lab to lab.

- **Performance:** Electrolytically generated gradients are more precise than mechanically proportioned gradients, and have lower dispersion because dead volume is lower. Also, absorption of atmospheric carbon dioxide (for KOH eluents) or ammonia is virtually eliminated, so eluent contamination is no longer a concern. You get lower background signal, reduced noise, smaller baseline shifts, and better peak resolution.
- **Reliability:** Seals and pistons last much longer than they do when pumping premixed eluents because the only fluid in contact with the pump is deionized water.

Just Add Water

Eluent generation is the heart of the ICS-3000 RFIC system. When your ion chromatograph automatically generates its own high-quality eluent on demand—in the exact amount and concentration needed for your application—you save time and effort while eliminating the variability that occurs with manually prepared eluents. No more measuring, mixing, and degassing. No more worrying about recipe errors or eluent contamination. You just add water and get great results.

Dionex eluent generators use electrolysis to convert pure water into potassium hydroxide or carbonate/bicarbonate eluent for anion separations. Methanesulfonic acid eluent is used for cation separations. The eluent's counter ion (potassium or methanesulfonate) comes from the EluGen cartridge reservoir; it diffuses across a membrane into the cartridge's high-pressure chamber during electrolysis. A degasser built into the cartridge outlet removes by-product gas (hydrogen or oxygen) from the eluent stream. The result is pure, contamination-free eluent delivered on demand in the exact concentration needed for your application.

By adding automated eluent generation and the ICS-3000 to your laboratory, you can join the growing number of semiconductor and electronics companies that benefit from improved detection levels, easier use, and easier training that comes with RFIC systems.

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