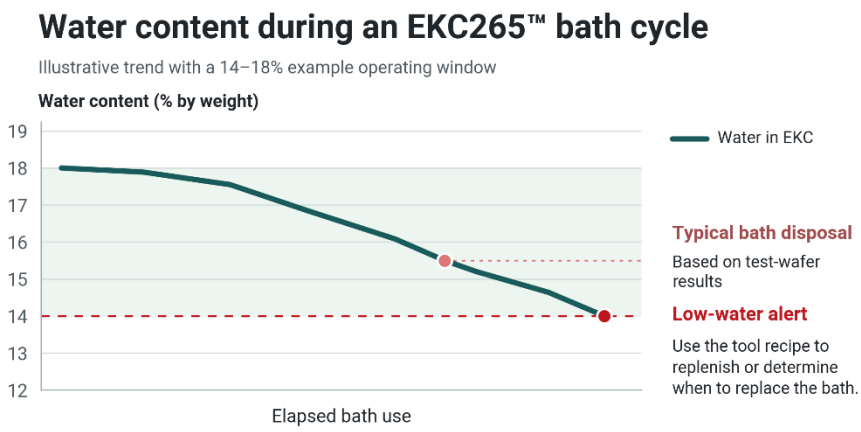
Benefits of R.I. measurement

- By incorporating the KxS DCM-10 Inline concentration monitor into post-etch residue removal process like EKC™ cleaning, semiconductor and MEMS manufacturers can extend usable bath life and stabilize cleaning by replenishing or replacing solvent based on changes in water content.
- This can reduce fresh solvent use, chemical waste and bath-change downtime.



Overview

Etching selectively removes material from a silicon wafer to create the required pattern. It can leave polymer residues on the wafer surface. After etching, a liquid cleaning chemical removes these residues in a step called *post-etch wet stripping*.

In a typical two-tank spray solvent system, the tool alternates between circulating the heated cleaning solution and spraying it onto the wafers during a wafer run. EKC265™ is a commonly used residue remover for this process. In one example, the solvent is held at 65–75 °C (149–167 °F) and the target water content is 14–18% by weight. The semiconductor fab qualifies the operating limits for its solvent formulation, tool and wafer process.

As the heated solvent is sprayed, water evaporates due to the high temperature. If the water content falls too low, the solvent can become less effective at removing residues. The KxS DCM-10 monitors water content in the recirculation line in real time, giving the fab a basis for deciding when to replenish the bath and when to replace it. This helps keep cleaning consistent, extend bath life and reduce fresh solvent consumption and chemical waste.

Refractive index measurement applications

The KxS DCM-10 measures the refractive index (RI) and temperature of the circulating solvent. A formulation-specific chemical curve converts these readings into temperature-compensated **water content** in % by weight.

Bath monitoring and control

The KxS DCM-10 measures the refractive index (RI) and temperature of the EKC265™ solvent in the recirculation line. A calibration curve specific to the solvent formulation converts these readings into temperature-compensated water content, indicated as a percentage by weight.

During a wafer run, water evaporates from the heated solvent and leaves through the spray tool exhaust. After the run, the solvent returns to the EKC tank and recirculation resumes. Depending on the tool recipe, part of the used solution may be drained and replaced with fresh EKC265™ and deionized (DI) water.

The DCM-10 supports two ways to manage the bath:

Monitor and alert. The tool controller uses the DCM-10 signal to alert operators when the water content reaches a qualified high or low limit. Trending water content alongside temperature shows how quickly the bath is approaching a limit. Operators can use that trend and the fab's bath-change criteria to decide when to replenish or replace the solvent.

Replenish or replace the bath. After each wafer run, the controller can use the DCM-10 reading to trigger a controlled addition, called *spiking*. The tool recipe determines whether to add DI water, fresh EKC265™, or both to bring the bath back toward its target. Replenishing based on the measured water content can extend usable bath life and reduce fresh solvent consumption.

Detecting solvent carryover into the IPA rinse

Some tools rinse the wafers with isopropyl alcohol (IPA) before drying. Residual EKC265™ can carry over into the rinse and change its refractive index. Because IPA and EKC265™ have different refractive indices, a separate DCM-10 in the IPA line can flag carryover once the fab has validated the detection threshold for its rinse conditions.

Instrumentation and installation considerations

DCM-10 is installed in the EKC265™ recirculation loop where the solvent is representative of the bath and flows across the prism during measurement.

The DCM-10 uses a PFA flow cell with a sapphire prism and ECTFE sealing. It sends concentration and temperature to the tool controller via Modbus TCP or two configurable 4–20 mA outputs.

Where the process includes an isopropyl alcohol (IPA) rinse, a separate, validated RI measurement can flag solvent carryover or detect the transition between process liquids.

DCM-10 unique features:

- **Extra small footprint design:** The compact sensor and flow are ideal and fit into fab tools and benches.
- **Excellent flow properties:** True full bore; Optimized laminar flow pattern with minimal shear force on liquid (US Pat. 12,774,953).
- **Easy installation:** Connects with process line sizes of ¼, ⅜, ½, ¾, and 1 inch, using standard fittings.
- **Dual-body construction:** Optical components remain intact even if the flow cell is removed, ensuring consistent performance.
- **Material compatibility:** Materials designed to withstand the demanding conditions of semiconductor processing in the facilities and cleanroom environments.

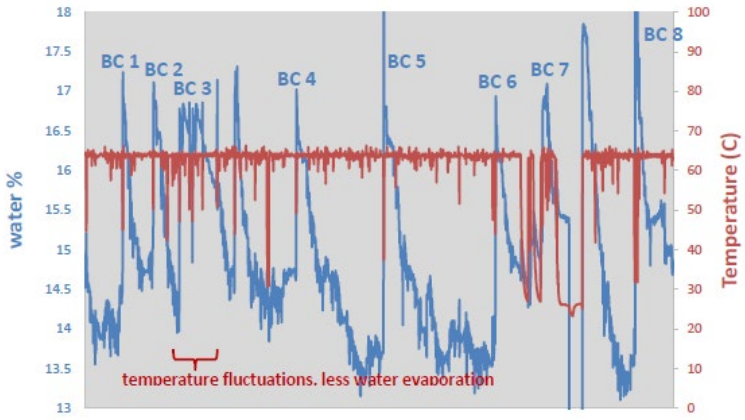


Fig. 1 shows the DCM-10 real-time monitoring of water and temperature over 1.5 months — fresh chemical peaks at 17–18% water.

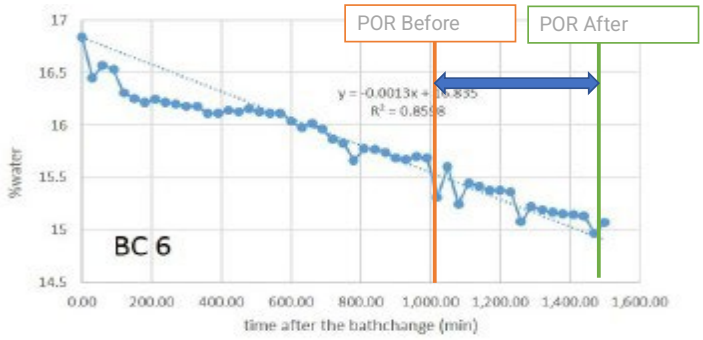


Fig. 2 shows Water degradation trend defining process-of-record (POR) before and after bath change.