Entegris

Process Monitoring Solutions

Increasing yield through complete control of CMP

Controlling Contaminants

For more than 50 years, many high-tech industries have relied on Entegris to ensure the protection and purity of their technologies throughout the supply chain, from the raw chemicals to the final products. At Entegris, we understand the unique challenges of contamination control to reduce defects and improve yield. From chemical concentration monitoring to fast and accurate measurement control, to advanced particle characterization, Entegris is well-positioned to offer chemical mechanical planarization (CMP) process stability monitoring solutions proven to increase yield, device performance, and system reliability to reduce financial loss in the semiconductor fab and liability in the electronic device supply chain.

With so much invested in equipment, having the proper metrology instrumentation in place will help ensure the protection of your CMP slurry, with the added benefit of improving yield. Partnering with Entegris, we can help you evaluate your system and determine the right, complementary metrology instruments for your business needs. With a broad product offering, advanced manufacturing capabilities, worldwide infrastructure, and unmatched technical expertise, we provide proven performance and reliability to protect your overall process quality and efficiency.

We offer three types of process data analytics that can help ensure high CMP yields: electrochemical analysis during blending, in-line process chemistry monitoring, and particle size determination.

CMP Process Overview

Successful fabrication of high-performance, complex semiconductor devices relies on CMP to planarize the wafer surface before depositing the next layer of metal or dielectric. More complex chip architectures require advanced lithography processing, which means wafers are undergoing multiple CMP steps for each layer.

While necessary, CMP can contribute to yield loss if the process is not tightly controlled. Precise control of slurry chemistry and working particle size through the CMP process is the key to enhancing yield, Figure 1.

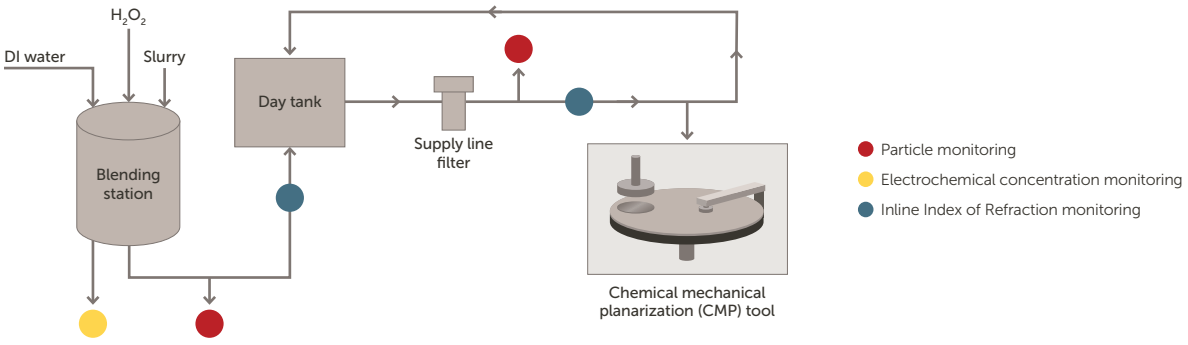

Figure 1. CMP process overview showing where chemical concentration monitoring and particle size analysis fit into the process flow.

Chemical Concentration Monitoring

Full, on-line chemical monitoring allows real-time correction of bath composition during slurry blending, and therefore, stable control of the process conditions from batch to batch. When immediately apparent, variations that can negatively affect product quality can be quickly corrected, helping to meet the demands for zero defect tolerances and higher product yields.

SEMICHEM ADVANCED PROCESS MONITOR (APM)

Our SemiChem APM is a wet chemical monitoring system that automatically samples, analyzes, and reports quantitative chemical concentration of critical processes. The first step in the monitoring process, the SemiChem APM connects to the blending station and provides class-leading chemical concentration data the helps optimize slurry stability.

- Proven, standard electrochemical techniques provide the industry's most precise monitoring available to maintain chemical composition and integrity
- Online, near real-time system detects process excursions in volatile chemistries, preventing loss of product quality
- Transitioning the lab technology to the process allows fast and accurate process control
- Rugged, industrial design withstands tough, industrial environments
- Portfolio includes SemiChem APM*i* 200, APM 200 wall mount, APM 200 single cell floor mount, APM 200 dual cell floor mount, and an APM 200 dual cell grabport

A trusted, central tool for controlling CMP peroxide in all wet chemical applications in microelectronic environments.

In-line Process Monitoring

Even if a metal CMP slurry passes all quality checks after blending, this is no guarantee that the chemistry will still be in balance when the slurry enters the CMP polisher. It is helpful to reevaluate the process chemistry immediately before the slurry is delivered to the wafer. In-situ process monitoring with compact tools that can take rapid measurements with minimal disruption to the process flow is practical and economical.

INVUE® GV148 CONCENTRATION MONITORS

The composition of the slurry blend can degrade over a day's use, introducing unwanted variability into the CMP process. We offer cost-effective, easy-to-install InVue GV148 concentration monitors that serve as a pre-check or early warning system to verify whether the slurry still meets specifications. If the concentration has drifted too far, an alarm will trigger and the process can be stopped, averting potential wafer scrap or yield loss.

- Window cleaning port allows easy access to sapphire window for cleaning any scale buildup on the window, ensuring measurement accuracy is maintained
- Monitors slurry integrity at multiple points by measuring the process fluid index of refraction (IoR) and temperature, then accurately calculates process fluid concentration
- Ultrapure wetted surfaces of fluoropolymers and sapphire maintain chemical purity and cleanliness
- Integrated in a compact, ultra-high purity package with integral electronics minimizes tool size
- Dynamic, user-friendly HMI software enables real-time data logging, analysis, and customization

Delivers real-time process fluid concentration measurements for chemical blending, spiking, and dilution without process intrusion.

Particle Size Measurement

CMP slurry manufacturers provide data on the nominal particle size of each batch of slurry concentrate. This data alone, however, is not reliable for precise quality control. The existence of large particles is a serious problem. Undetected, large particle counts (LPC) can create micro-scratches on a wafer. Online monitoring serves as an insurance policy to keep LPC from reaching the polishing tools.

ACCUSIZER® MINI SYSTEM

Our particle characterization solutions enable customers to perform particle size analysis online, in real time. In advanced-node CMP applications, automating the monitoring process can help prevent costly yield excursions.

- Proven, single particle optical sizing (SPOS) technology allows users to individually size and count particles in CMP slurries over a wide range with unprecedented accuracy
- Engineered using a modular design that allows us to match sensors and fluidics to customer slurries and process equipment
- Continuously monitors LPC in CMP slurry delivery systems and helps optimize filtration and other process conditions
- Fully customizable modules include the AccuSizer Mini FX system, AccuSizer Mini LE system, and AccuSizer Mini FX-Nano system

Advanced systems for automated online particle size and/or counts analysis.

Why Entegris?

As mega-trends such as artificial intelligence, smart cars, the Internet of things, and augmented reality evolve to meet the growing needs of speed, scale, and reliability, they put pressure on integrated device (IC) manufacturers to increase processor power efficiency and memory size. As device manufacturers strive to produce higher performing chips with more complexity and component integration at acceptable efficiencies and yields, they face significant challenges in terms of process control and economics. With less room for error, process optimization of CMP slurries is necessary to achieve desired yields.

With our broad portfolio of process monitoring instruments, advanced materials handling, specialty chemicals, and engineered materials, we are uniquely positioned to help customers face these challenges and meet these new worldwide consumer and business data demands at lower costs. Ongoing investments in technology, robust manufacturing, and supply-chain capabilities make us a proven, trusted partner. Our global infrastructure, technology portfolio, and operational excellence are unmatched by the competition. Entegris is well positioned to provide accurate, reliable, real-time CMP process monitoring solutions that help reduce the risk of defects and improve overall process yield.

Sales and Applications Support

Entegris continually invests in expanding analytical and technology center capability globally. Our global direct sales team, sales channel partners, local applications engineers, and world-class customer service give you the support and expertise to solve your most difficult problems. This intimacy allows us to better understand your needs through direct feedback and roadmap sharing. By aligning our materials science, engineering, and R&D initiatives, we can develop indispensable contamination-control and high-performance solutions to solve your roadmap challenges.

eCommerce

Entegris has deployed an online purchasing and transaction management system that provides full eCommerce capabilities for our customers. For us, eCommerce is more than just a shopping cart, but rather a robust technology platform designed to deepen customer engagement and deliver value at every touchpoint. Driven by our customers' desire for lower costs, improved accuracy, and overall increased satisfaction, we have implemented state-of-the-art tools and full integration with our back-end systems to allow automated access to information, accelerated and easier transactions, and a convenient means to collaborate and do business.

Logistics Expertise

To support your logistics requirements, we manage the infrastructure and service provider partnerships, offering broad capabilities to ensure your supply chain door to door. Providing import processing, insurance, and transportation, we bring expertise in air, ocean, LTL, intermodal, small package, and hazardous shipments. You will receive in-house, regional logistic support in the U.S., Germany, Israel, South Korea, Japan, Taiwan, Malaysia, Singapore, and China. And our top-ranked freight partners provide import processing services and transportation to all the remaining locations around the globe.

Our global infrastructure with local R&D, manufacturing, and support focuses on specific customer needs throughout the world.

Experience You Can Count On

Process monitoring is critical to your manufacturing and has a direct impact on production yields, product reliability, and operational efficiency. We focus on understanding your processes and developing solutions to ensure tight control over slurry processes. Tight control over slurry properties including chemistry, working particle size, and particle size distribution helps achieve the desired removal rate and minimize CMP-induced defects.

Trust us to support your vital applications and goal for zero defects by providing the highest purity, highest quality, and most robust products. Our reliable, cost-effective process monitoring solutions provide a line of defense to prevent defect-causing contaminants in current and new technology nodes.

Our expertise and innovative technology can help fabs achieve CMP mastery.

LIMITED WARRANTY

Entegris' products are subject to the Entegris, Inc. General Limited Warranty. To view and print this information, visit entegris.com and select the Legal & Trademark Notices link in the footer. Entegris does not warranty any failure in the case of customers using unapproved foreign components.

FOR MORE INFORMATION

Please call your Regional Customer Service Center today to learn what Entegris can do for you. Visit entegris.com and select the Contact Us link to find the customer service center nearest you.

TERMS AND CONDITIONS OF SALE

All purchases are subject to Entegris' Terms and Conditions of Sale. To view and print this information, visit entegris.com and select the Terms & Conditions link in the footer.

Entegris

Corporate Headquarters
129 Concord Road
Billerica, MA 01821
USA

Customer Service
Tel +1 952 556 4181
Fax +1 952 556 8022
Toll Free 800 394 4083