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TriboLab CMP

Process and Material Characterization System

Chemical mechanical polishing (CMP) is an enabling process for planarization and smoothing of materials used in semiconductor device manufacturing and many other advanced technologies. R&D teams are continuing to investigate ways to leverage CMP for new materials, new device types, and improved device integrations.

Due to complex interactions between the pad, slurry, conditioning method, process recipe settings, and many other variables, CMP process development can be challenging. This research is further complicated by the fact that all of the major responses are transient, both run to run and within a single process cycle time.

Bruker's TriboLab CMP Process and Material Characterization System has been designed from the ground up specifically for reliable, flexible, and cost-effective bench characterization of wafer polishing processes.

Small R&D-scale specialty system for CMP

- Reproduces full-scale wafer polishing process conditions without downtime on production equipment
- Provides unmatched measurement repeatability and detail
- Allows testing on small coupons for substantial cost savings over whole-wafer testing

On-board diagnostics for better understanding of polishing processes

- Delivers more visibility into transient polishing properties than any other system on the market
- Collects data from the instant the substrate touches the pad and throughout the entire test
- Enables early-stage process development decisions through more complete, detailed data

Flexibility in sample type, size, and mounting configurations for widest applicability

- Polishes any flat material, using virtually any conditioning disc, any slurry, and any pad
- Accommodates small coupons through whole 100 mm wafers with ease
- Accepts multiple sample mounts for flexibility

There are now more than 1000 Bruker tribology systems performing advanced testing in leading research laboratories, top universities, and national labs. Bruker's TriboLab has become the standard for tribology and mechanical test labs around the world.

Leveraging over 20 years of CMP characterization expertise with its predecessor product (Bruker CP-4), TriboLab CMP brings a complete set of capabilities to the industry-leading TriboLab platform. The resulting accuracy and measurement repeatability enables the highly effective qualification, inspection, and ongoing functionality testing required throughout the CMP process. TriboLab CMP is the only process development tool on the market that can provide a broad range of polishing pressure (0.05-50 psi), speeds (1 to 500 rpm), friction, acoustic emissions, and surface temperature measurements for accurate and complete characterization of CMP processes and consumables.

TriboLab CMP Specifications

Measurement Capability	Small footprint, chemical mechanical polishing test platform
System Attributes	Integrated high-speed/high-torque upper and lower rotational drive motors; Servo-controlled precision loading stage; Motorized positioning "lateral" stage; Load/friction sensor for polishing and pad conditioning load control, measurement, and recording; In-Situ acoustic emission and temperature measurement and recording; Corrosion protection of machined parts; Programmable two-pump slurry and rinse pumping system
Software	Bruker CMP operating and data analysis software
Computer System	Windows OS; 2GB SDRAM; >250GB HDD
Vertical Position System	>100 mm (4 in) travel; 0.5 µm (19.7 µin) encoder resolution; 0.001 to 10 mm/sec (0.04 to 394 min/sec) speed
Lateral Positioning and Sliding System	>75 mm (3 in) travel; 0.25 µm (9.8 µin) encoder resolution; 0.001 to 10mm/sec (0.04 to 394 mil/sec) speed
Wafer Head	1 to 500 rpm speed range; 0.29 to 29 psi range on 2 in wafer head 0.07 to 7.2 psi range on 4 in wafer head 4 to 400 N (0.9 to 90 psi) load range for other wafer sizes up to 4 in; <20 mN (0.004 lb) resolution
Platen	1 to 500 rpm speed range; Up to 9 in (228 mm) platen size:
Conditioner	2 to 200 N (0.45 to 45 lb) load range; 10 mN (0.002 lb) resolution; Up to 4.25 in conditioning head size
Torque Capability	5 Nm (3.7 ft-lb) @ 100 RPM, 2.5 Nm (1.8 ft-lb) @ 500 RPM
Temperature Measurement	-25°C to 1000°C (-13°F to 1,832°F)
Acoustic Emission Response	0.2 to 5.0 MHz frequency response
Programmable Pump (optional)	2.2 to 480 mL/min (0.13 to 29 in^3/min) flow rate
Power Requirement	220 VAC, 2.5 kW
System Dimensions	394 mm (W) x 610 mm (D) x 775 mm (H) [15.5 in x 24 in x 30.5 in]

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