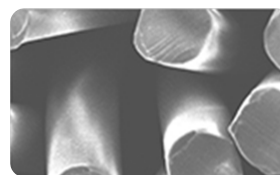


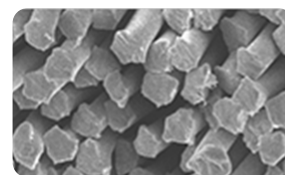
## Maximizing Semiconductor Yield: The Value of Microfiber Cleanroom Wipers in Microelectronics

### INTRODUCTION

In microelectronics and semiconductor manufacturing, where even a single submicron particle or fiber can cause costly defects, maintaining an ultra-clean environment is critical to achieving high yields and meeting stringent quality standards. Microfiber cleanroom wipers, engineered from ultrafine polyester or polyester/nylon blends with fibers finer than 1 denier, offer unmatched performance in **contamination control, surface safety, and cleaning efficacy.**



Normal Polyester



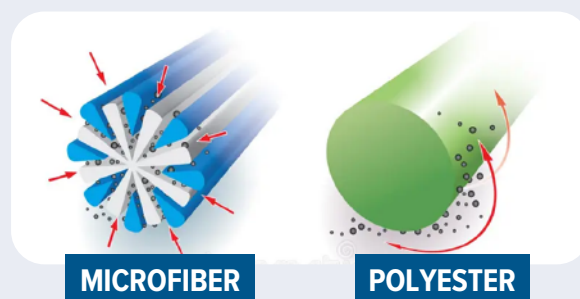
Microdenier Fiber

### WHY MICROFIBER WIPERS?

#### KEY VALUE BENEFITS FOR MICROELECTRONICS

Microfiber wipers are designed to meet the rigorous demands of semiconductor manufacturing, delivering **significant value to fab managers and process engineers:**

- **Unrivaled Contamination Control:** Microfiber wipers remove up to 99.9% of submicron particles, minimizing defects in advanced nodes (e.g., 3–7 nm) and boosting wafer yields.
- **Cost Savings:** Superior cleaning efficiency reduces wiper and solvent usage, lowering operational costs while maintaining compliance with ISO 14644 standards.



**Picture:** A split fiber of Microfiber material allows particles to get in between the splits, which picks and retains the particles inside the fibers.

- **Surface Protection:** Their soft, non-abrasive texture prevents scratches on delicate surfaces like wafers, photomasks, and optical components, safeguarding high-value assets.
- **Low-Linting Durability:** Advanced weaving and sealed-edge designs ensure minimal fiber shedding, extending wiper usability and reducing waste.
- **Process Reliability:** Lot-tested for particle and fiber release, microfiber wipers provide consistent performance, supporting high-volume production and audit readiness.

These benefits translate into **higher yields, fewer defects, and optimized fab operations**, delivering **measurable ROI** for microelectronics manufacturers.



## MINIMAL PARTICLE AND FIBER SHEDDING

Semiconductor cleanrooms, typically ISO 3–5 (Class 1–100), demand the lowest possible particle and fiber contamination to prevent defects in processes like photolithography, etching, and deposition. Microfiber wipers excel in these environments due to their low-linting properties. Unlike polyester/cellulose blends, which shed high levels of particles ( $>50 \mu\text{m}$ ) due to their nonwoven structure, microfiber wipers use continuous-filament yarns and sealed edges to virtually eliminate fiber release. Products like Teknipure's **MicroClean™** (sealed edge microfiber) and **MicroClean™ Pro** (sealed border microfiber) are tested to meet ISO Class 3 standards.

### Operational Advantage:

- **Improved Yields:** In 3–7 nm node production, microfiber wipers reduce particle-induced defects, such as micro-bridging on wafers, minimizing rework costs.
- **Audit Compliance:** Lot-coded and tested via Liquid Particle Counting (LPC), according to IEST-RP-CC004.4, Section 7.2, microfiber wipers provide documented cleanliness, simplifying ISO 9001 and SEMI standard audits.

## SCRATCH-SENSITIVE SURFACES

Microelectronics manufacturing involves highly sensitive surfaces, such as silicon wafers, photomasks, and optical components in EUV lithography systems. A single scratch can render a wafer unusable, costing thousands of dollars. Microfiber wipers, with their ultrafine, soft fibers, are ideal for these applications. Their non-abrasive texture ensures gentle cleaning without compromising surface integrity.

### Operational Advantage:

- **Asset Protection:** Prevents scratches on wafers and photomasks, reducing defect rates and protecting multimillion-dollar equipment.
- **Solvent Compatibility:** Microfiber wipers work seamlessly with solvents like 6%, 70% and 100% Isopropyl Alcohol (IPA), ensuring residue-free cleaning of delicate surfaces.

## SUPERIOR PARTICLE AND FIBER PICKUP

In semiconductor cleanrooms, capturing and retaining submicron particles and residues is critical for cleaning tools, workstations, and equipment like deposition chambers or wafer handlers. Microfiber wipers' dense network of ultrafine fibers - up to eight times more filaments than standard wipers - enables exceptional pickup of particles down to 0.1  $\mu\text{m}$ . Industry tests show microfiber wipers outperform polyester/cellulose blends in residue removal, making them ideal for cleaning post-etch residues or handling accidental spills in fabs.

### Operational Advantage:

- **Enhanced Process Control:** Removes 99.9% of particles, reducing contamination risks in critical steps like chemical vapor deposition (CVD) or ion implantation.
- **Operational Efficiency:** Faster cleaning with fewer strokes minimizes downtime, supporting high-throughput production.



## GOWNING ROOMS



Gowning rooms are critical entry points to ISO 3–5 cleanrooms. Microfiber wipers, often pre-saturated with 6% or 70% IPA, are used to wipe down gloves, visors, and equipment, removing particles and fibers shed from garments. Their low-linting design prevents introducing contaminants into the fab.

### Operational Advantage:

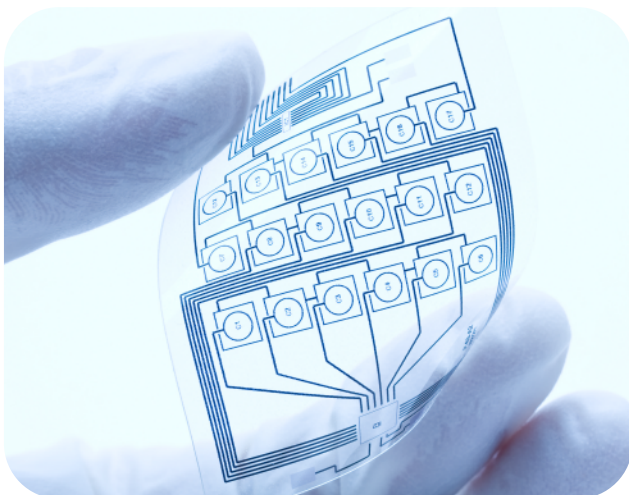
- Reduces human-related contamination (80–90% of fab contaminants), ensuring compliance with Standard Operating Procedures (SOPs).





## CONCLUSION: A STRATEGIC CHOICE FOR SEMICONDUCTOR SUCCESS

Microfiber cleanroom wipers deliver unmatched value for microelectronics and semiconductor manufacturers. Their exceptional performance in low-particle environments, gentle cleaning for scratch-sensitive surfaces, and superior pickup capabilities make them indispensable in ISO 3–5 cleanrooms and gowning areas. Compared to traditional wipers, microfiber offers better contamination control, surface protection, and cleaning efficiency, reducing defects and operational costs. By adopting high-quality microfiber wipers like **MicroClean™** and **MicroClean™ Pro**, fab operators can **enhance yields, protect valuable assets, and ensure compliance** with industry standards, **driving profitability** in high-stakes semiconductor manufacturing.



## SOURCES

**ISO 14644-1:2015:** Cleanroom classification standards for particle limits in ISO 3–5 environments.

**SEMI Standards:** Guidelines for contamination control in semiconductor manufacturing.

**Cleanroom Technology** (<https://www.cleanroomtechnology.com/>): Various articles on wiper materials, particle shedding, and applications in microelectronics cleanrooms.

**Semiconductor Digest** (<https://www.semiconductor-digest.com/>): Insights into contamination control challenges in 3–7 nm node production and the role of low-linting wipers.