

GLASS SURFACE ENGINEERING — TECHNICAL FAQ

SiO₂ Glass Coating Platform Solvent-Based & Aqueous | Dual-Layer & Single-Pass Architectures

1. What is the core technology behind this glass platform?

All glass products are built on a **chemically bonded, inorganic silicon dioxide (SiO₂) surface-engineering platform**.

At a fundamental level, these coatings:

- Chemically bond to glass via **Si–O–Si linkages**
- Form an **inorganic silica network**, not an organic film
- Deliver durability through **network structure and controlled wear**, not chemical depletion

This same core science underpins:

- Automotive windshields
- Aftermarket automotive glass
- Architectural glass
- Solar glass
- Consumer electronics glass

What changes between products is **architecture**, not chemistry.

2. Why does the platform support both dual-layer and single-pass systems?

Because **not all glass experiences the same stress**.

The platform intentionally supports two architectures:

- **Dual-Layer Architecture**
Used where mechanical abrasion and durability demands are extreme.
- **Single-Pass Architecture**
Used where simplicity, throughput, or aftermarket practicality is prioritized.

Both architectures rely on the **same SiO₂ surface-engineering principles**.

3. What is the dual-layer architecture?

The dual-layer system separates functions into two inorganic layers:

Base Layer

- Chemically anchors to the glass
- Forms the structural foundation
- Manages interfacial stress and humidity cycling
- Is not intended to be the wear surface

Topcoat

- Provides hydrophobicity and surface durability
- Acts as the **sacrificial wear layer**
- Controls abrasion and chemical exposure

This architecture ensures **wear occurs at the surface**, not at the glass interface.

4. When is a dual-layer system required?

Dual-layer systems are required when glass is exposed to:

- Continuous windshield wiper abrasion
- High particulate loading (sand, grit)
- Repeated washer-fluid exposure
- Long OEM durability expectations

This is why **OEM windshield applications** rely on dual-layer systems.

5. What is the single-pass architecture?

A single-pass system combines:

- Glass anchoring
- Surface durability
- Hydrophobic behavior

into **one uniform inorganic SiO₂ layer**.

Single-pass systems are **not films** and **not wipe-on polymers**. They are chemically bonded surface treatments engineered for controlled wear.

6. Why do single-pass systems exist at all?

Because **not every application needs dual-layer complexity**.

Single-pass systems are ideal when:

- Abrasion is moderate
- Process speed matters
- Cost sensitivity is high
- Aftermarket or retrofit use is required
- A second coating pass is impractical

This makes single-pass systems well-suited for:

- Aftermarket automotive glass
 - Non-wiper glass
 - Architectural glass
 - Factory-throughput-driven applications
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7. How do dual-layer and single-pass systems compare?

Feature	Single-Pass	Dual-Layer
Number of coats	1	2
Abrasion durability	Very good	Maximum
Mechanical shear tolerance	Moderate	High
Process complexity	Low	Higher
Cost sensitivity	High	Lower
Failure mode	Gradual surface wear	Gradual topcoat wear

Both architectures fail by predictable wear — not peeling or delamination.

8. What role do solvent-based systems play?

Solvent-based SiO₂ systems are used when:

- Maximum durability is required
- Network formation must be precisely controlled
- Factory or controlled application environments exist

They are common in:

- Automotive windshields
 - High-stress glass
 - Specialty exterior surfaces
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9. What role do aqueous systems play?

Aqueous SiO₂ systems are designed for:

- Factory throughput
- Regulatory friendliness
- Lower VOC profiles
- Easier handling and cleanup

They preserve the **same inorganic network principles** as solvent systems and are the **default choice** for:

- Architectural glass
 - Solar glass
 - Large-area flat glass processing
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10. Why is single-pass aqueous the default for architectural glass?

Architectural glass:

- Has no wiper shear
- Is factory processed
- Experiences weathering, not abrasion
- Is cost- and throughput-sensitive

As a result:

- **Single-pass aqueous systems are the default**
 - Dual-layer aqueous systems are reserved for extreme environments
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11. Are phone and tablet glass formulations the same as architectural glass?

No.

While the **platform design rules are shared**, formulations differ due to:

- Touch frequency
- Oils and acids from skin contact
- Optical sensitivity
- Cure method (ambient vs heat-assisted)

The platform transfers — **not the exact formulation.**

12. How is this different from PFAS-based glass coatings?

PFAS coatings:

- Rely on fluorinated surface chemistry
- Degrade chemically over time
- Face increasing regulatory restrictions

This platform:

- Is **PFAS-free**
 - Does not use fluorinated silanes or surfactants
 - Relies on **inorganic structure**, not fluorine
 - Degrades by **predictable mechanical wear**
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13. How is this different from ceramic or polymer films?

Ceramic and polymer coatings are often:

- Thick, rigid, film-forming layers
- Solvent-heavy
- Labor-intensive
- Prone to cracking, haze, or delamination

This platform:

- Operates at micro- to sub-micron scale
 - Chemically bonds to glass
 - Does not form peelable films
 - Fails gradually without cosmetic failure
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14. Are these systems OEM-only?

No.

The platform supports:

- OEM factory-applied systems
- Aftermarket and service-applied systems
- Single-pass and dual-layer workflows

This flexibility is a **core platform advantage**.

15. What is the designed failure mode?

For all glass systems:

Gradual surface wear, not delamination or chemical collapse.

This allows predictable maintenance and reapplication without aggressive removal or surface damage.

16. Key takeaway

This is a single inorganic SiO₂ surface-engineering platform delivered through different architectures. Dual-layer systems maximize durability under extreme abrasion, while single-pass systems maximize simplicity and scalability — without changing the underlying chemistry.
