MINERAL-HOSTED FIRE RESISTANCE PLATFORM — TECHNICAL FAQ

Functional Fire-Retardant Additives for Polymers, Foams, Coatings, Gypsum & Composites

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1. What is the Mineral-Hosted Fire Resistance platform?

This platform consists of **engineered mineral particles** designed to function as **fire-resistant additives** when incorporated into bulk materials.

The particles are based on **mineral substrates**—such as zeolite, synthetic zeolite, silica, aluminosilicate, clay, or diatomaceous earth—that are **coated with an insoluble, non-migrating fire-resistant (FR) layer**.

They are **additives**, not surface coatings, and are intended to be mixed directly into materials during manufacturing.

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2. What problem does this platform solve?

Traditional fire-retardant systems often:

- Leach or migrate over time
- Require high loadings that weaken materials
- Interfere with polymer chemistry or foam expansion
- Rely on halogens, heavy metals, or soluble salts

This platform solves those problems by using **mineral-hosted fire-resistant chemistry** that is:

- Thermally stable
- Insoluble and non-leaching
- Compatible with a wide range of manufacturing processes

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3. What is meant by “mineral-hosted” fire resistance?

“Mineral-hosted” means the **fire-resistant chemistry is bonded to the surface of a mineral particle**, rather than being added as a free or soluble fire-retardant.

The mineral substrate acts as:

- A **thermal barrier**
- A **structural host** for fire-retardant chemistry
- A **non-reactive, stable carrier** during processing and fire exposure

The mineral itself is not the fire-retardant—the **engineered particle** is.

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4. What types of minerals are used as substrates?

Suitable mineral substrates include:

- Zeolite (natural or synthetic)
- Synthetic zeolites (A, X, Y, ZSM-5)
- Silica (amorphous, precipitated, colloidal)
- Aluminosilicates
- Clay (kaolin, bentonite, montmorillonite)
- Diatomaceous earth
- Perlite, vermiculite, calcium silicate

Particle size is selected based on the target material system.

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5. How does the fire-resistant layer work?

The fire-resistant (FR) layer comprises **inorganic or organophosphorus fire-retardant chemistries** that are:

- Insoluble
- Non-migrating
- Thermally stable
- Bonded to the mineral surface

During fire exposure, the additive can:

- Promote char formation
- Reduce heat transfer
- Suppress flame spread
- Reduce heat release rate
- Improve burn-through resistance

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6. Is this a fire-retardant coating or paint?

No.

This platform is **not a paint, coating, or intumescent layer applied to a surface**.

It is a **functional additive** that is incorporated *into*:

- Plastics
- Foams
- Paints and coatings
- Gypsum and drywall cores
- Cementitious materials
- Composites

Fire resistance is imparted **from within the material**, not from a surface film.

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7. How is this different from traditional fire-retardant fillers?

Traditional fillers are often inert or weakly active and require high loading levels.

This platform differs because:

- The fire-resistant chemistry is **engineered onto the mineral**
- Lower effective loadings are possible
- The additive does not dissolve, leach, or migrate
- Material properties are better preserved

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8. In what materials can these additives be used?

The platform is compatible with:

- **Plastics & Thermoplastics**
  PVC, PE, PP, ABS, TPU, TPE (via melt compounding, extrusion, injection molding)
- **Foams**
  Polyurethane (flexible and rigid), PIR, polyiso, latex, memory foam
- **Coatings & Paints**
  Water-based or solvent-based architectural, industrial, and protective coatings
- **Gypsum & Drywall**
  Gypsum slurries, drywall cores, fire-rated boards
- **Cementitious Materials**
  Mortars, plasters, stuccos, fireproofing sprays
- **Composites**
  Fiberglass systems, engineered panels, wood-plastic composites (WPC)

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9. Does the additive interfere with manufacturing processes?

No.

The mineral-hosted additives are designed to behave as:

- Non-reactive fillers
- Thermally stable particulates

They do **not** interfere with:

- Polymerization
- Catalysts or curing systems
- Blowing agents in foams
- Extrusion or molding operations

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10. What particle sizes are used?

Typical particle size ranges include:

- 1–5 µm for coatings and clear films
- 1–10 µm for textiles and laminates
- 1–50 µm for plastics, foams, and composites
- 5–50 µm for gypsum and cementitious systems

Particle size is selected based on dispersion, performance, and process compatibility.

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11. Is this platform halogen-free?

Yes.

The fire-resistant performance is achieved **without halogenated flame retardants**, heavy metals, or soluble salts.

Performance is driven by:

- Mineral structure
- Inorganic fire-resistant chemistry
- Stable, non-migrating architectures

12. Is antimicrobial performance part of this platform?

No — **not by default**.

The core platform is **fire-resistance only**.

Some embodiments *optionally* include an antimicrobial precursor layer, but those are:

- Separate configurations
- Not required for fire-resistance
- Not part of odor control or bedding systems

Fire-resistance functionality stands alone.

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13. What is the designed failure mode?

The designed failure mode is:

Gradual thermal and structural degradation under extreme fire exposure, not leaching, dripping, or chemical release.

The additive remains mineral-bound and does not volatilize.

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14. Key takeaway

This platform delivers fire resistance by embedding engineered, mineral-hosted fire-retardant particles directly into materials, creating internal fire breaks and thermal barriers without coatings, halogens, or leaching behavior.
