



Oxygen Scavenger Masterbatch

An Oxygen Scavenger Masterbatch is a type of functional additive masterbatch designed to actively absorb and neutralize oxygen inside plastic packaging materials. It is widely used in food, beverage, pharmaceutical, and cosmetic packaging where oxygen can cause spoilage, discoloration, oxidation, or loss of freshness.

What it is

- A concentrated polymer-based additive that contains oxygen scavenging agents (commonly iron-based, polybutadiene-based, or other proprietary formulations).
- Supplied in pellet form, blended into polymers like PET, PE, PP, PS, or multilayer films during extrusion or injection moulding.

How it works

- Once incorporated into the packaging, the masterbatch reacts with oxygen molecules that permeate through the plastic or are trapped inside the sealed package.
- This slows down oxygen ingress and protects the product from oxidation without the need for chemical preservatives.

Considerations

- Effectiveness depends on **concentration, polymer matrix, and packaging thickness.**
- Must comply with **food-contact safety regulations** (FDA, EU, etc.).
- Requires careful processing to ensure scavenger activation without premature reaction.

Advantages

- Extends shelf life without altering taste, aroma, or quality.
- Reduces or eliminates the need for vacuum packaging, gas flushing, or preservatives.
- Works in monolayer or multilayer films.
- Cost-effective compared to alternative active packaging solutions.

Applications

Food Packaging

- Extends shelf life of oxygen-sensitive foods (meat, dairy, bakery, snacks, coffee).
- Prevents rancidity, flavour loss, and mould growth.

Beverages

- Protects beer, wine, fruit juices, and carbonated drinks from oxidation.

Pharmaceutical & Nutraceutical

- Maintains stability of oxygen-sensitive drugs and supplements.

Cosmetics

- Prevents degradation of oils, fragrances, and active ingredients.



Performance Metrics

- Can reduce oxygen content to below 1 ppm, significantly extending shelf life.
- Shelf-life gains vary by formula and packaging: some systems support over 2 years of protection for pharmaceuticals, while food and beverages typically see extensions from several months to years, depending on container design and external conditions
- Sustainability features: some materials are formulated to support high rPET content, maintain clarity, reduce yellowing, and even simplify recycling

Compatibility & Processing

Common carrier resins include PET, PE, PP, EVA, and others; these are chosen based on processing requirements and packaging applications

Designed to be processed via extrusion, injection moulding, film blowing, and can be added as either monolayer or multilayer formulations

Engineered to maintain optical clarity, mechanical properties, and recyclability, especially in PET-based packaging

Summary

Category	Highlights
Formulations	Polycaprolactone + sodium metabisulfite (5–50 %), or iron/organic scavengers blended into resins.
Mechanism	Irreversible or reversible abstraction of O ₂ via chemical reaction; multi-agent systems for complex performance.
Category	Highlights
Resin Compatibility	PET, PE, PP, EVA, others; suitable for monolayer or multilayer packaging, extruded or moulded.
Performance	Reduces O ₂ to <1 ppm; shelf-life extensions vary: from months (food) to 2+ years (pharma).
Sustainability	Supports rPET, maintains clarity, recyclable, and lightweight packaging options through cap-based systems.
Market Insights	~\$22.5 B in 2023; 8 % CAGR through 2032. Demand driven by food packaging, pharma, and active packaging trends.
Innovation	Toward natural scavengers, enzyme-based systems, UV-triggered scavengers, dual gas control & integrated indicators.

