

Stainless in Stainless Steel Definition - HPLC Primer

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Overview

The term *stainless steel* refers to a family of iron-based alloys engineered to resist corrosion, staining, and rust formation.

These materials are widely used in laboratory, analytical, and industrial environments because they maintain a clean surface appearance and structural integrity under conditions that would quickly degrade ordinary carbon steels.

Why Stainless Steel Resists Corrosion

Chromium as the Key Alloying Element

- Stainless steel contains added chromium, which is responsible for its corrosion-resistant behavior.
- When chromium is present in sufficient concentration (typically $\geq 10.5\%$), it forms a passive oxide layer on the metal surface.
- This passive film:
 - Self-heals when damaged
 - Protects the underlying metal from oxidation
 - Minimizes rust and discoloration

How It Differs from Carbon Steel

- Standard carbon steels readily rust, stain, and corrode in the presence of moisture, oxygen, or chemicals.
 - Stainless steel prevents such degradation because of the chromium-rich protective surface layer.
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Where Stainless Steel Is Used

Common Laboratory Applications

- HPLC tubing, column hardware, and fittings
- Mobile-phase inlet filters and sparging stones
- Laboratory instruments that require structural durability and chemical resistance

Advantages in Chromatography

- Provides stable, inert fluid pathways
- Maintains high mechanical strength under pressure

- Reduces contamination from corrosion residues

[Wikipedia article about Stainless Steel](#)

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