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Ion Content Differences Between Clear and Amber Borosilicate Glass Vials – Tech Information

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Selecting the proper vial glass type is essential for minimizing contamination, maintaining sample consistency, and ensuring compatibility with sensitive analytical methods. Clear and amber borosilicate glass vials may appear similar in performance, but their **chemical composition and ion content differ** in meaningful ways, especially for trace-level analyses.

Glass Types Used in Clear vs. Amber Vials

Clear borosilicate autosampler vials can be manufactured from either Type 33 glass or N51A glass, both defined under ASTM specifications for chemical durability and composition.
Amber vials, however, are always made from N51A glass, which incorporates additional components to achieve light-blocking properties.
[mtc-usa.com]

Ion Content Differences

Ion content is one of the most significant distinctions between clear and amber borosilicate glass. The table below (as provided in the original data) shows typical ion ranges present in each glass type:

Ion	Type I Clear (33)	Type I Amber (51)
Sodium (Na)	0.3–0.5 µg/mL	0.4–1.4 µg/mL
Potassium (K)	ND	ND–0.02 µg/mL
Calcium (Ca)	ND	ND–0.1 µg/mL
Magnesium (Mg)	ND	—
Aluminum (Al)	ND	ND–0.5 µg/mL
Iron (Fe)	ND	ND
Barium (Ba)	ND	ND–0.2 µg/mL
Zinc (Zn)	ND	ND
Manganese (Mn)	ND	ND
Silicon (Si)	ND	ND–5 µg/mL

ND = Not Detectable

What These Differences Mean for Analytical Use

Because amber glass must incorporate additional materials to achieve UV/visible light protection, it naturally contains higher or broader ranges of detectable ions. While both clear and amber

borosilicate glasses meet ASTM standards for Type I glass, analysts performing trace-ion or ultra-low-level elemental analyses may observe:

- Slightly increased background ion levels in amber vials
- Potential influence on highly sensitive ionic or elemental assays
- Improved photoprotection from amber glass but at the cost of slightly higher extractable ions

For most chromatographic applications—LC, LC-MS, GC, GC-MS—these ion differences do **not** create performance issues. However, users working at the limits of detection should factor in the higher ion content of N51A amber glass.

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VIALS AND CAPS

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