Pressure Rating of Headspace Vials and Caps - Tech Information

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Headspace vials are routinely exposed to elevated internal pressures during GC headspace analysis, particularly when samples are heated to promote volatilization. Understanding the true pressure-bearing limitations of the vial system helps prevent ruptures, seal failures, and unsafe operating conditions. MICROSOLV™ and BASIC™ brand headspace vials are engineered to meet these demands, but the limiting factor is often misunderstood.

Vial Strength and Wall Thickness

All MICROSOLV ™ and BASIC™ brand headspace vials are manufactured with a 1.2 mm wall thickness, providing enhanced mechanical durability under heat and pressure. This thickness ensures the vial body itself will not burst under normal analytical conditions, even during moderately pressurized operation.

The True Weak Point: Cap and Septum

Contrary to common assumptions, the cap and septum—not the glass vial—are the weakest components of a headspace system under pressure.

When internal pressure increases, the septum deforms upward and exerts force against the aluminum or steel cap. If the pressure becomes excessive:

- The septum can bulge severely.
- The aluminum cap may tear or rupture.

This failure mode typically occurs long before the glass vial itself would break.

Pressure Performance

Performance varies depending on cap design:

With pressure-relief cap systems

- Some MICROSOLV ™ and BASIC™ brand vials equipped with pressure-relief caps have been reported to withstand up to 10 bar before failure.

With standard headspace caps

- Standard aluminum caps typically fail at or near 10 bar, often without warning, making them unsuitable for high-pressure conditions if no relief mechanism is present.

Thus, the “10 bar limit” applies primarily to caps, not the vial body.

Best Practices for Safe Use

To ensure safety and reliable performance:

- Match the vial with a properly rated cap and septum for your method's expected pressure range.
- Use pressure-relief caps if working with highly volatile samples, aggressive heating programs, or unknown pressure conditions.
- Do not overtighten screw caps, as this can distort the septum, compromise sealing, and increase risk of blow-off.
- Inspect caps and septa regularly for wear, chemical attack, swelling, or deformation; replace at the first sign of damage.

🔗 Click ***HERE*** for MICROSOLV ™ Headspace Vial and Cap Ordering Information

AUTOSAMPLER
VIALS AND CAPS

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