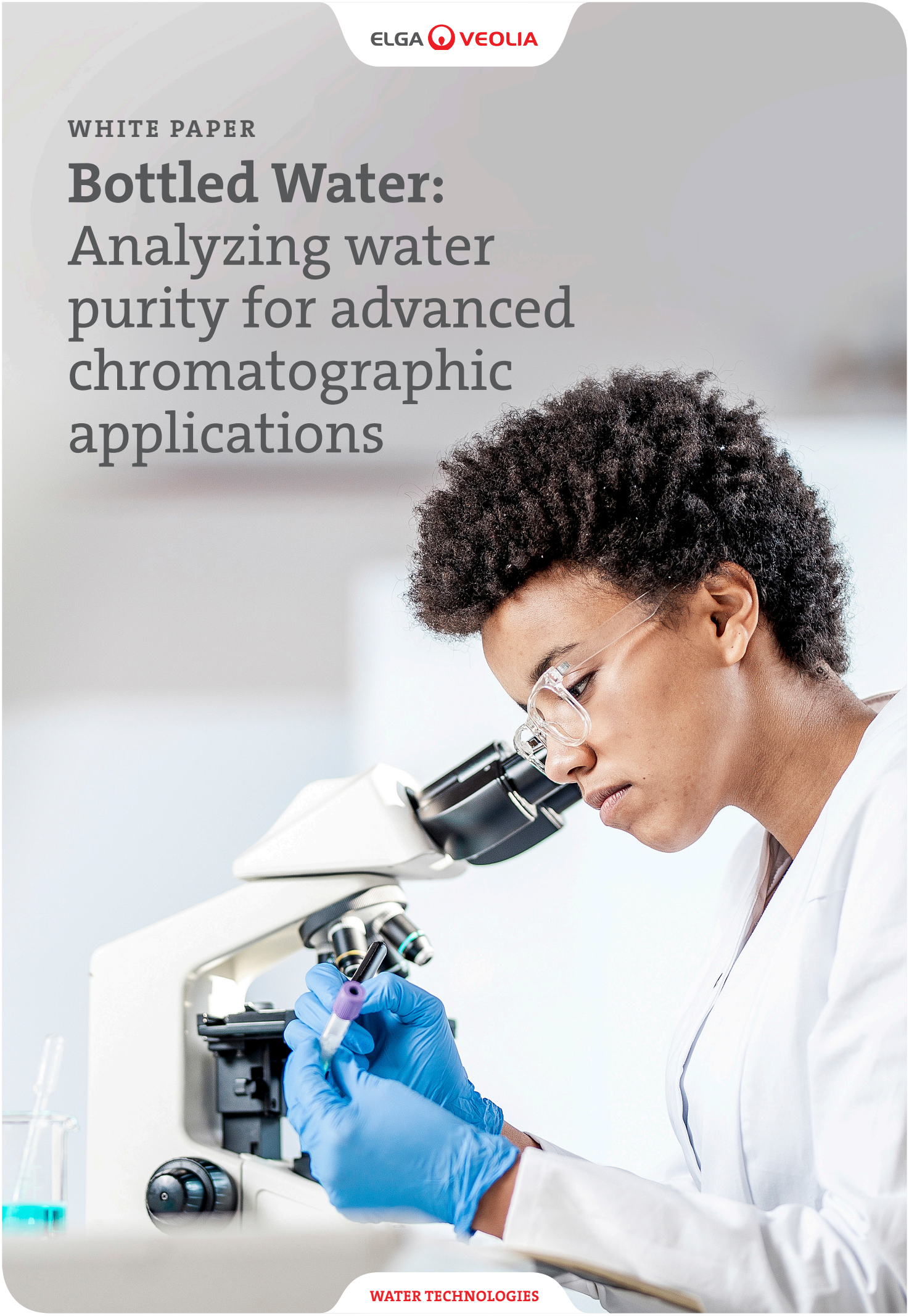
ELGA VEOLIA

WHITE PAPER

Bottled Water: Analyzing water purity for advanced chromatographic applications



WATER TECHNOLOGIES

WHITE PAPER

Bottled Water: Analyzing water purity for advanced chromatographic applications

Background

Liquid chromatography (LC) – either standalone or coupled with mass spectrometry (LC-MS) – is a widely-established separation technique used in a number of applications from forensic science to clinical diagnostics. Good chromatographic performance is highly dependent on the purity of the water used, particularly when you are looking to detect compounds in the parts per billion (ppb) range.

Water is an important solvent used in the pretreatment of samples for LC, including solid phase extraction, and the preparation of eluents, reagent blanks and standards. It is therefore critical to use highly purified water to avoid inaccurate calibration, and sample degradation resulting from the presence of impurities such as organic compounds and bacteria. Additionally, the use of untreated water can allow particles to build up within the column, pump and filters of an LC system, increasing the need for maintenance and the overall lifetime running costs.

Improving chromatography sensitivity

Impurities present in water may reduce the analytical sensitivity by increasing unwanted background noise and generating extra or enlarged peaks in the chromatogram, making it hard to distinguish between different components. Organic contaminants in water are known to compete with the analyte(s) for active sites on the LC stationary phase, consequently inhibiting binding of the compounds of interest and potentially causing ghost peaks. This is a particular concern when using software to automatically select the peak(s) of interest, as unexpected changes can make it difficult to correctly identify the analyte signal among the background noise.

Dissolved gases, particles, colloids, bacteria and organic compounds can all have detrimental effects on results by either producing higher background values or interfering with the analysis directly. Labs often use commercially available HPLC grade water that is typically supplied in bottles. However, the quality of individual bottles of water cannot be validated easily as they are at risk of degradation during storage. Consequently, this water can give significantly inferior results when used as an eluent. Therefore, sensitive and reliable LC-MS analysis, as we know it, would not be possible without a high-quality water purification system, such as the ELGA PURELAB® Chorus range*, which can remove all the major types of impurities that might interfere with these analyses, ensuring the quality of every last drop.

Comparing the ELGA PURELAB system with commercially available bottled water

To test the consistency of water quality, a PURELAB Chorus 1 Complete was set up with a 30-liter reservoir and fed with potable water. The water was dispensed daily (60 l/day) over a six-month period to simulate a typical usage pattern and total organic carbon (TOC) was measured approximately every two weeks (Figure 1). The PURELAB system was found to dispense water with consistently lower levels of TOC than the specification required, demonstrating its reliability to remove organic compounds.

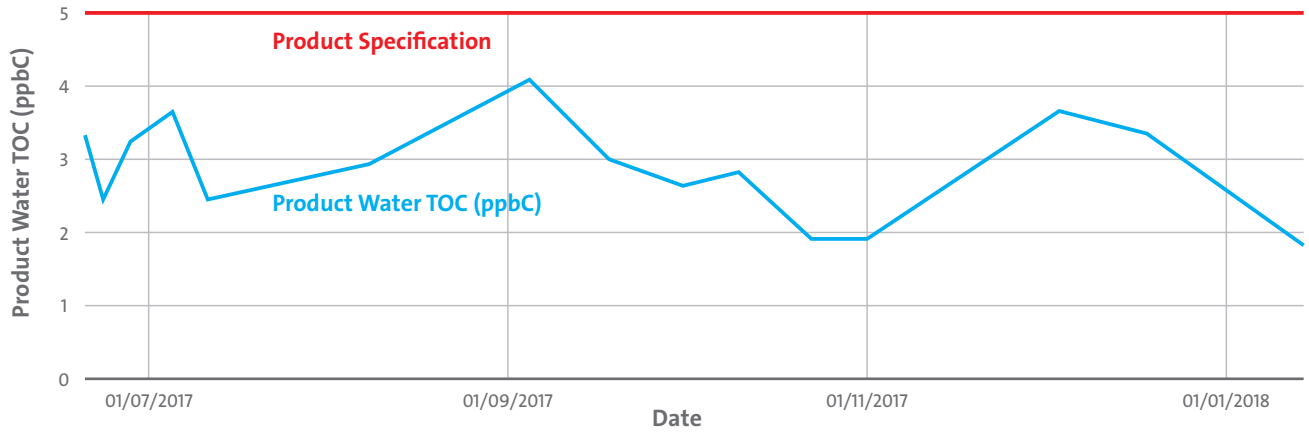


Figure 1. TOC performance of a PURELAB Chorus 1 Complete over six months.

Comparison of bottled water with water produced from an ELGA PURELAB system showed that more phthalates were present in freshly opened bottled water than in ultrapure water dispensed by the PURELAB Chorus 1 Complete (Figure 2). These phthalates are just one type of impurity that, if not removed, could contaminate samples, standards and blanks, and consequently interfere with results. The PURELAB Chorus 1 is designed to continually assess the quality of your water and effectively remove these chemical compounds, along with bacteria and other organics, so that you can have confidence in the accuracy of your results.

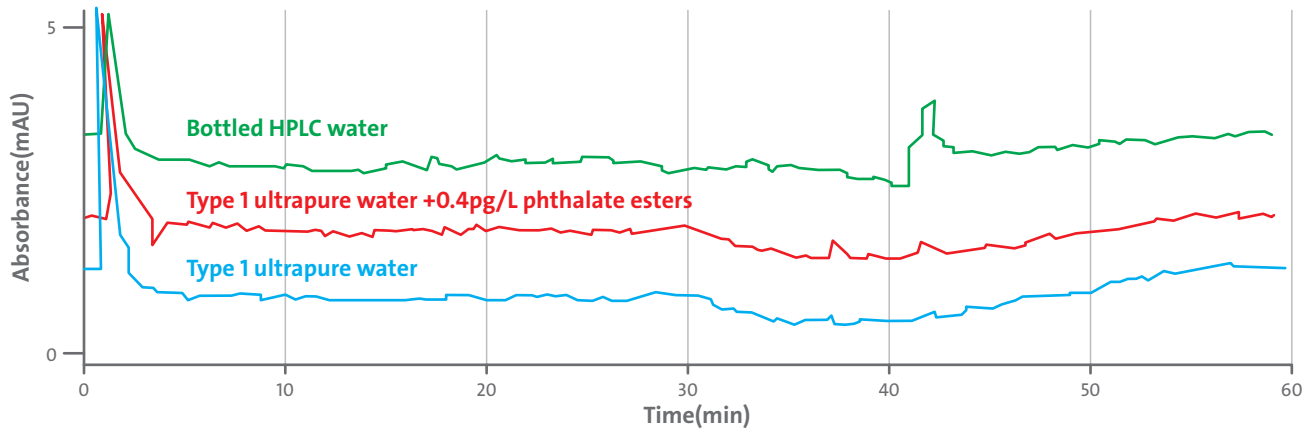


Figure 2. HPLC traces of phthalates in purified bottled and ultrapure water. Ultrapure water consistently had lower levels of phthalates than bottled water.

Conclusion

The PURELAB Chorus range encompasses several effective purification technologies in a simple, compact system, to dispense water suitable for high-sensitivity LC and LC-MS applications. The purification cycle minimizes bacteria, organic compounds and residual ions in water. This ensures that users can have confidence that calibration standards and blanks, as well as samples, will not be contaminated. Pure water can also prevent the build-up of particles and bacteria in essential components of LC systems to limit lifetime running costs and maintenance requirements.

*The PURELAB Chorus range offers a variety of different water purification systems, from the Chorus 1 that is used for the most critical and sensitive applications through to the Chorus 3, which is ideally suited for general purpose applications in your laboratory. The range is now available with an innovative free standing Dispenser that maximizes space and improves lab efficiency. Additionally, Hubgrade, ELGA's digital platform, works alongside any system to monitor equipment performance, ensuring laboratory work continues uninterrupted.

ELGA VEOLIA

Dedicated to Discovery

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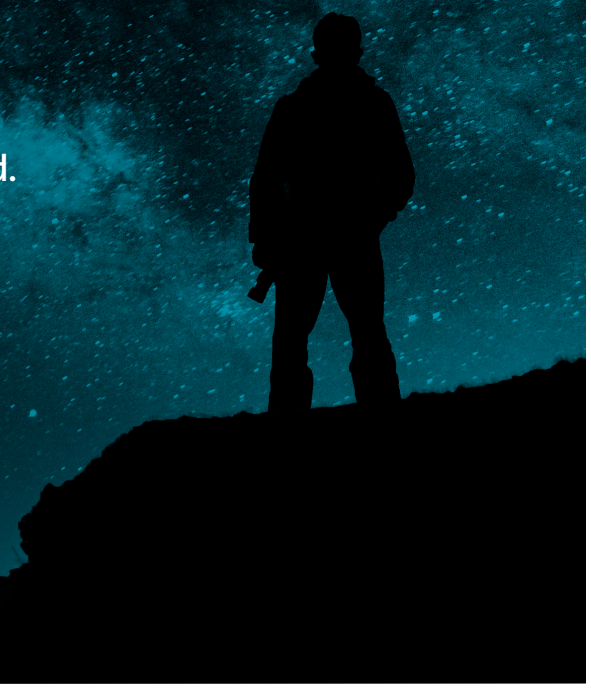
ELGA Labwater are specialists in the engineering, service & support of water purification systems.

Unrivalled product design has achieved international recognition and awards.

Worldwide technical service teams support science & healthcare globally with specialist expertise.

Global digital performance monitoring from Hubgrade ensures laboratory work is uninterrupted.

A global supply chain supports clients from regional centres on every continent.



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