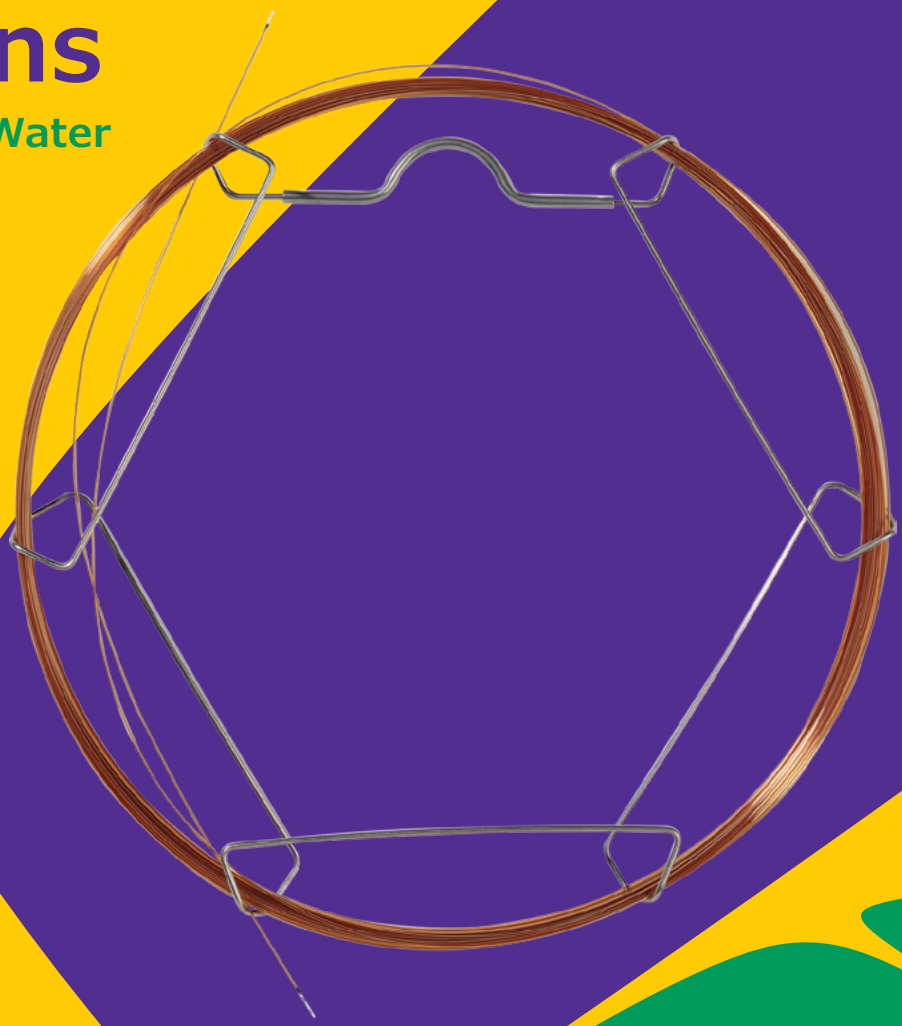
Watercol™ Capillary GC Columns

Convenient Analysis of Water



Supelco®
Analytical Products

Watercol™ 1910 is a specialized ionic liquid column designed for gas chromatography, particularly effective for moisture analysis. Its chemical structure enhances water retention and detection sensitivity.

This column excels in separating water from various volatile organic compounds, making it suitable for analyzing complex matrices.

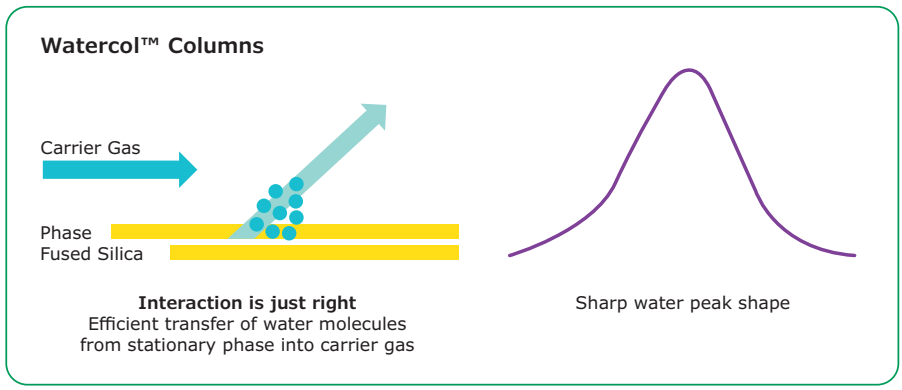
Compared to traditional methods like Karl Fischer titration, Watercol™ 1910 offers improved accuracy and speed, significantly reducing analysis time while maintaining high precision.

Its stability against water and thermal degradation further solidifies its role in analytical chemistry, including pharmaceutical, petroleum, and environmental applications.

Interaction Strength

The fundamental property driving the performance of Watercol™ series columns is the proper combination and strength of water, i.e. column interactions.

Water: Column Interactions



Ionic Liquids: A Versatile Solution for Gas Chromatography

Ionic liquids (ILs) are a unique class of solvents characterized by their liquid state at room temperature, consisting entirely of ions. They have gained significant attention in the field of gas chromatography (GC) due to their distinct properties and advantages.

Tunable Properties: The physicochemical properties of ILs can be easily manipulated by varying the cation and anion, allowing for customization to suit specific analytical needs.

High Thermal Stability: ILs exhibit superior thermal stability compared to traditional GC stationary phases, enabling their use at elevated temperatures without degradation. Example, SLB®-IL60i has a higher maximum temperature than most PEG/WAX columns.

Low Vapor Pressure: Their negligible vapor pressure minimizes contamination risks and enhances safety during GC applications.

Dual Polarity: ILs can function as both polar and nonpolar solvents, providing excellent selectivity for a wide range of analytes, including polar and nonpolar compounds.

Enhanced Separation Efficiency: ILs improve peak shapes and resolution, facilitating the analysis of complex mixtures and trace components.

With these attributes, ionic liquids represent a promising alternative for GC stationary phases, offering scientists innovative solutions for advanced analytical challenges.

For more information visit: **SigmaAldrich.com/il-gc-inert**

Watercol™ Checklist

Sharp Peak Shape:

Water can be integrated and quantified – see **Figure 1** and **Figure 3**.

Linear Response:

r^2 value of 0.9923 achieved from a 5-point calibration curve – see **Figure 2**.

Great Sensitivity:

- 100 ppm using a thermal conductive detector (TCD)
- <100 ppm using a mass spectrometer detector (MSD) or a vacuum ultraviolet spectroscopy detector (VUV)
- < 10 ppb using a barrier discharge ionization detector (BID)

Small Sample Size:

GC results can be obtained using small sample sizes, such as <2 mL gasoline and <0.2 g ibuprofen.

Selectivity Options:

Whether water is an analyte or the injection solvent – see **Figure 3** and **Figure 4**.

Suitability

Narrow peak widths and optimal peak heights are also produced for other small polar analytes. Watercol™ columns are suitable for applications where:

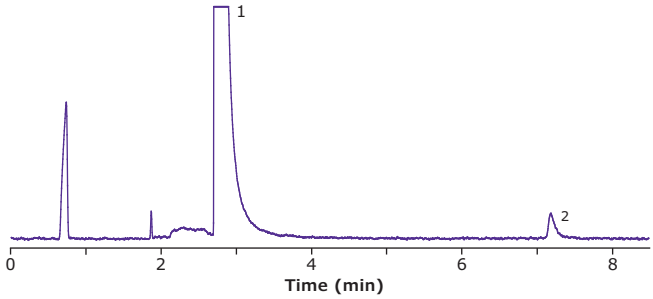
- Water is an analyte: can be integrated and quantified
- Water is the injection solvent: because it does not tail, it does not interfere chromatographically with other analytes

Column Selection

Quantify water as an analyte or quantify small polar analytes in water. The chromatograms in this brochure cover a variety of analytes and compound classes.

Figure 1. Water Standard (0.05% in Ethanol) on Watercol™ 1910

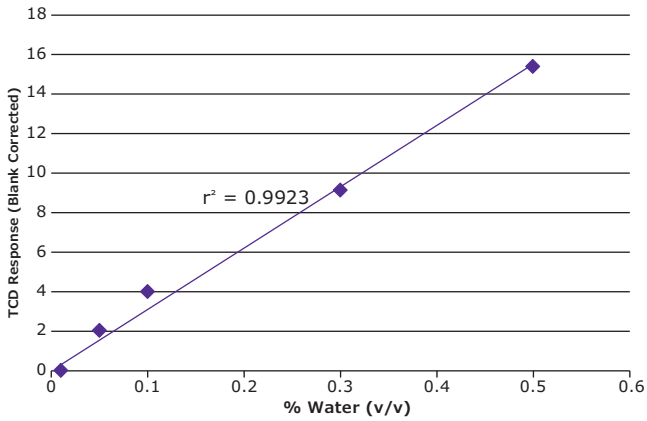
Column	Watercol™ 1910, 30 m × 0.25 mm I.D., 0.20 µm (**29711-U**)
Oven	80 °C (10 min)
Inj. temp.	250 °C
Detector	TCD, 200 °C
Carrier gas	helium, 26 cm/sec
Injection	0.5 µL, 100:1 split
Liner	4 mm I.D., split type, cup design (**2048225**)
Sample	water at 0.05% (v/v) in ethanol



1. Ethanol 2. Water

Figure 2. Water Calibration Curve (0.01–0.5%) on Watercol™ 1910

Column	Watercol™ 1910, 30 m × 0.25 mm I.D., 0.20 µm (**29711-U**)
Oven	80 °C (10 min)
Inj. temp.	250 °C
Detector	TCD, 200 °C
Carrier gas	helium, 26 cm/sec
Injection	0.5 µL, 100:1 split
Liner	4 mm I.D., split type, cup design (**2048225**)
Sample	5 standards, water at 0.01, 0.05, 0.1, 0.3, and 0.5% (v/v), each in ethanol



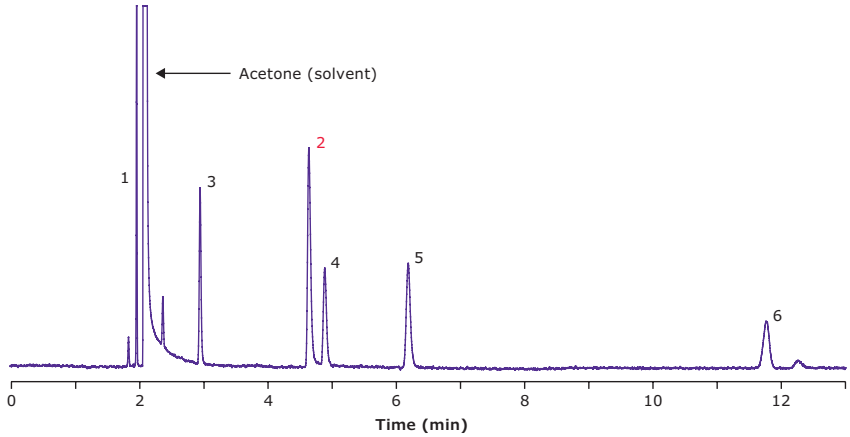
Water Measurement Determination

Karl Fischer Titration (KFT) has long been the standard for water determination. Gas Chromatography (GC) with Watercol™ columns represents a modern alternative, offering enhanced sensitivity and accuracy for water analysis, paving the way for more reliable and efficient future applications.

Feature/Aspect	Gas Chromatography with Watercol™ 1910	Karl Fischer Titration (KFT)
Sensitivity	Higher sensitivity (1-100 ppm)	Moderate sensitivity (5-500 ppm)
Sample Size	Smaller sample volume required	Larger sample volume needed
Hands-On Time	Less hands-on time	More hands-on time
Interference from Reagents	Minimal unwanted side reactions	Prone to interferences from organic compounds and acids
Chemical Waste	Lower volume of chemical waste	Higher volume of chemical waste
Solubility Issues	No solubility issues	May encounter solubility issues
Simultaneous Analysis	Can analyze water and volatiles	Typically analyzes only water
Worker Exposure	Reduced exposure to harmful chemicals	Higher exposure risk
Legacy vs. Modern	Modern, innovative method	Legacy method

Figure 3. Water as an Analyte

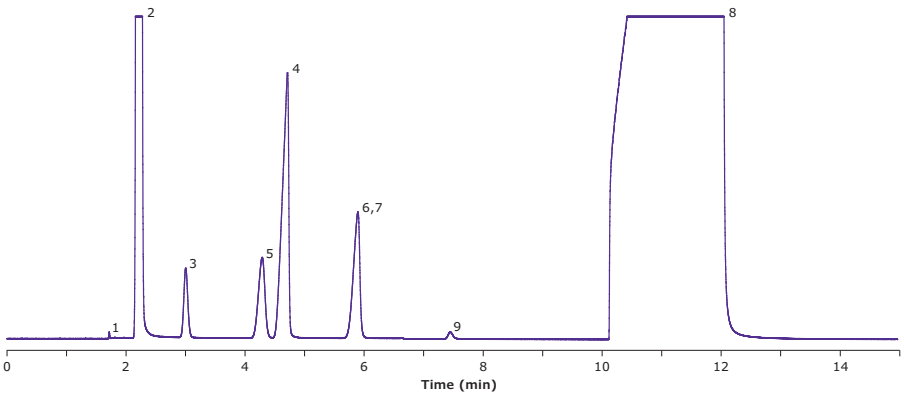
Column	Watercol™ 1910, 30 m x 0.25 mm I.D., 0.20 µm (**29711-U**)
Oven	96 °C
Inj. temp.	250 °C
Detector	TCD, 200 °C
Carrier gas	helium, 26 cm/sec
Injection	1 µL, 100:1 split
Liner	4 mm I.D., split type, cup design
Sample	6 analytes in acetone



1. *n*-Tridecane 2. Water 3. 2-Octanone 4. 1-Heptanol 5. 1-Octanol 6. Naphthalene

Figure 4. Water as the Injection Solvent

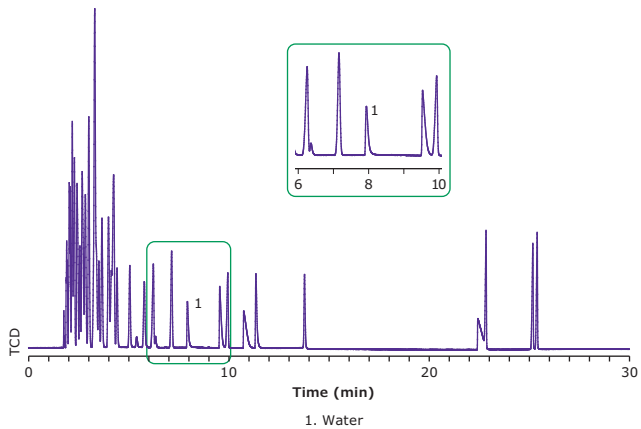
Column	Watercol™ 1910, 30 m x 0.25 mm I.D., 0.20 µm (**29711-U**)
Oven	35 °C, 4 °C/min to 125 °C (2 min)
Inj. temp.	250 °C
Detector	TCD, 300 °C
Carrier gas	helium, 25 cm/sec
Injection	1 µL, 100:1 split
Liner	4 mm I.D., split type, cup design **(2048225)**
Sample	8-component solvent mix in water



1. Acetone 2. Methylene chloride 3. Isopropanol 4. Ethanol 5. Methanol 6. *n*-Propanol 7. 1,4-Dioxane 8. Water 9. *n*-Butanol

Figure 5. Water in a 60-Component Solvent Mix (Chemical Application)

Column	Watercol™ 1910, 30 m × 0.25 mm I.D., 0.20 µm (**29711-U**); two identical columns installed in the same inlet using a 2-hole ferrule, each going to a separate detector
Oven	50 °C (1 min), 5 °C/min to 180 °C (5 min)
Inj. temp.	250 °C
Detector	FID, 250 °C
Detector	TCD, 200 °C
Carrier gas	helium, 25 cm/sec (measured in each column at an oven temperature of 125 °C)
Injection	1 µl, 100:1 split
Liner	4 mm I.D., split/splitless type, wool-packed single-taper FocusLiner™ design (**2879925-U**)
Sample	mixture of 60 solvents, each at 0.2% (v/v), and water at 0.3% (v/v), in pentane

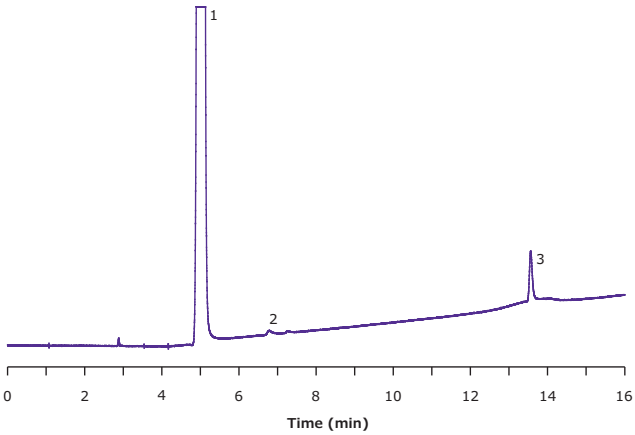


1. Water

Additional chromatograms, product information, real-time availability, and ordering information is available 24 hours a day at **SigmaAldrich.com/watercol**

Figure 6. Water in Ibuprofen (Pharmaceutical Application)

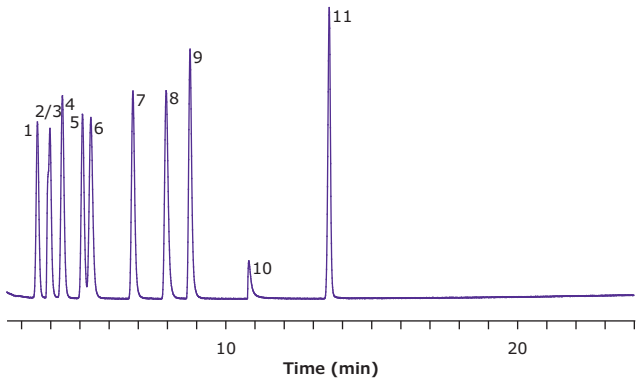
Column	Watercol™ 1910, 30 m x 0.25 mm I.D., 0.20 µm (**29711-U**)
Oven	35 °C (4 min), 8 °C/min to 130 °C (1 min)
Inj. temp.	250 °C
Detector	TCD, 200 °C
Carrier gas	helium, 11.40 psi constant pressure (equal to 25 cm/sec), measured with oven at 35 °C
Injection	1 µL, 100:1 split
Liner	4 mm I.D., split/splitless type, wool-packed single-taper FocusLiner™ design (**2879925-U**)
Sample	0.198 g ibuprofen weighed into a 1 mL volumetric flask, 0.5 mL acetone added, vortexed slowly for 30 seconds, acetone added to the 1 mL line, vortexed, transferred to an autosampler vial



1. Acetone 2. Isopropanol (from syringe wash) 3. Water

Figure 7. Water Impurity in C1-C6 Alcohol Mix

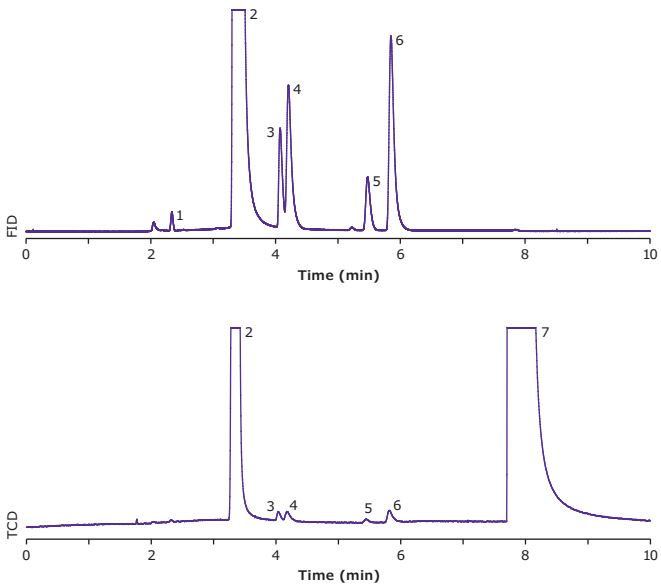
Column	Watercol™ 1910, 30 m x 0.25 mm I.D., 0.20 µm (**29711-U**)
Oven	40 °C (2 min), 4 °C/min to 125 °C (1 min)
Inj. temp.	300 °C
Detector	MSD, m/z = 18–500
MSD interface	260 °C
Carrier gas	helium, 1.1 mL/min
Injection	1 µL, 100:1 split
Liner	3.4 mm I.D., split/splitless type, wool-packed straight FocusLiner™ design (**2877605-U**)
Sample	10-component alcohol mix in methylene chloride, 500 µg/mL total concentration (mixture adsorbed some water during storage)



1. Isopropanol 2. Methanol 3. Ethanol 4. 2-Butanol 5. *n*-Propanol 6. Isobutanol 7. *n*-Butanol 8. Isoamyl alcohol 9. Pentanol 10. Water 11. Cyclohexanol

Figure 8. Aroma Fusel Alcohols in Tequila (Food and Beverage Application)

Column	Watercol™ 1910, 30 m x 0.25 mm I.D., 0.20 µm (**29711-U**); two identical columns installed in the same inlet using a 2-hole ferrule, each going to a separate detector
Oven	50 °C (1 min), 5 °C/min to 180 °C (3 min)
Inj. temp.	250 °C
Detector	FID, 200 °C
Detector	TCD, 200 °C
Carrier gas	helium, 25 cm/sec (measured in each column at an oven temperature of 125 °C)
Injection	1 µL, 100:1 split
Liner	4 mm I.D., split/splitless type, wool packed single taper FocusLiner™ design (**2879905-U**)
Sample	neat tequila



1. Ethyl acetate 2. Ethanol 3. *n*-Propanol 4. Isobutanol 5. Active amyl alcohol 6. Isoamyl alcohol 7. Water

Watercol™ capillary GC columns contain innovative ionic liquid stationary phases that produce a sharp peak shape for water, allowing the convenient measurement of water by GC.

Table 1. Watercol™ Series Column Specifications

Watercol™ 1910	
USP Code	None
Phase	Non-bonded; 1,11-Di(3-hydroxyethylimidazolium) 3,6,9-trioxaundecane trifluoromethanesulfonate
Temp. Limits	30 °C to 180 °C (isothermal or programmed)

Ordering Information

Description	Cat. No.
30 m × 0.25 mm I.D., 0.20 µm	**29711-U**
30 m × 0.32 mm I.D., 0.26 µm	**29714-U**

Related Information

Additional chromatograms, product information, real-time availability, and ordering information is available 24 hours a day at **SigmaAldrich.com/watercol**

Did you know...?

The descriptive numbers (1910) indicate the Kovats Retention Index (KRI) value of water at 100 °C isothermal oven temperature. KRI values indicate the elution location of the analyte relative to n-alkanes, in which the n-alkane carbon number is multiplied by 100. For example, a KRI value of 1910 indicates that water elutes after nonadecane (nC19) and 10% of the interval before eicosane (nC20) elutes in 100 °C isothermal oven temperature.

Supelco®, a brand under the Life Science business of Merck KGaA, Darmstadt, Germany, has a legacy of providing high-quality chromatography products and solutions, particularly in gas chromatography. Tracing its roots to 1966, Supelco® Analytical Products has been recognized for its innovative stationary phases, columns, and accessories that have significantly advanced analytical chemistry with a focus on quality, reliability, and supporting you, our customers.

Supelco®

Analytical Products

MilliporeSigma
400 Summit Drive
Burlington, MA 01803

SigmaAldrich.com

To place an order or receive technical assistance:
SigmaAldrich.com/support

For local contact information:
SigmaAldrich.com/offices

We have built a unique collection of life science brands with unrivalled experience in supporting your scientific advancements.

Millipore® Sigma-Aldrich® Supelco® Milli-Q® SAFC® BioReliance®

MS_BR14203EN Ver. 1.0
60243
01/2025