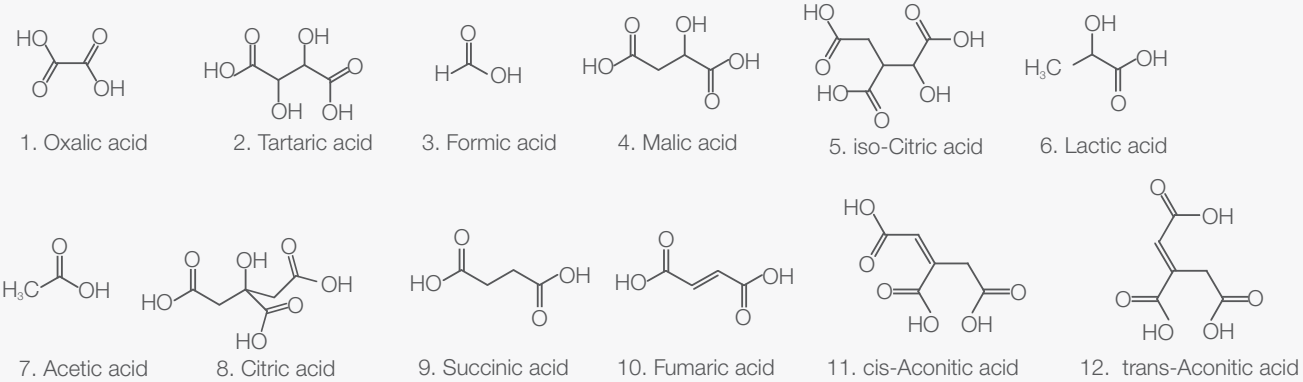
Acclaim Organic Acid (OA) columns

For separation of hydrophilic aliphatic and aromatic organic acids

Thermo Scientific™ Acclaim™ Organic Acid (OA) Columns are reversed-phase bonded-silica columns, use-tested for the separation of hydrophilic aliphatic and aromatic organic acids at low pH with ultra-violet (UV) detection. Acclaim OA columns use a patented polar-embedded stationary phase that allows a broad range of operating conditions, including 100% aqueous mobile phases.

Hydrophilic organic acids



Column features

- Use-tested to guarantee consistent organic acid separations
- Compatible with 100% aqueous mobile phases, optimum for reversed-phase retention of hydrophilic aliphatic organic acids
- Hydrolytic stability at low-pH conditions, optimum for reversed-phase retention of organic acids
- Ideal selectivity for separating a wide spectrum of organic acids, including hydrophilic aliphatic acids, C1 to C7 aliphatic acids, aromatic acids, and selected amino acids
- Suitable for analysis of foods, beverages, pharmaceuticals, chemical intermediates, and environmental samples
- Ideal for quality assurance offering fast run times and minimal sample preparation

Guaranteed organic scid separations

The Acclaim OA column line features a patented polar-embedded stationary phase optimized and use-tested for hydrophilic organic acid separations. The Acclaim OA column stationary phase is compatible with 100% aqueous mobile phases and has excellent hydrolytic stability at low pHs and ideal selectivity for separating a wide spectrum of organic acids.

Acclaim OA column performance is guaranteed. Acclaim OA columns undergo extensive testing to ensure column-to-column reproducibility, and are shipped with certificates of analysis detailing these tests.

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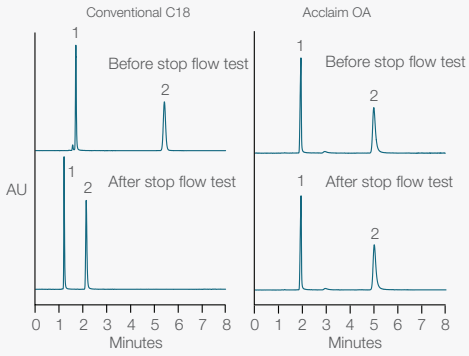
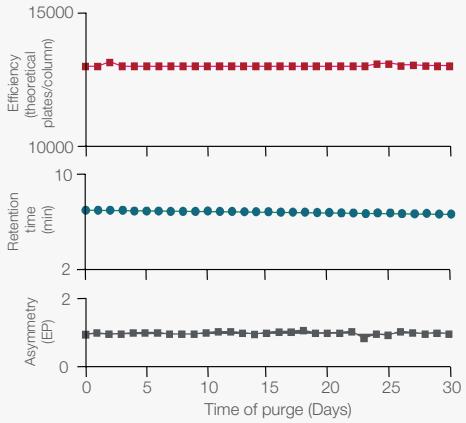
Consistent performance with 100% aqueous mobile phases

Due to their solubility properties, many polar-organic acids are better retained and resolved on reversed-phase HPLC columns using 100% aqueous mobile phases. The typical phases used in reversed-phase chromatography are very hydrophobic, and the functional groups tend to self-associate when using these 100% aqueous conditions. This self-association leads to reversible reduced retention of analytes. The Acclaim OA columns eliminate this variable retention by incorporating a polar-functional group into the silane linkage, near the surface of the silica particle. This polar group allows water to penetrate and hydrate the silica surface, preventing self-association of the carbon chains. This patented bonding technology allows the hydrocarbon chains to remain extended, even with 100% aqueous mobile phases.



Column	Acclaim OA, 5 µm
Dimensions	4.6 × 150 mm
Mobile phase	2.5 mM methanesulfonic acid
Temperature	30 °C
Flow rate	1 mL/min
Inj. volume	5 µL
Detection	UV, 210 nm
Peaks	1. Tartaric acid 2. Fumaric acid

Figure 1. Comparison of a conventional C18 column and the Acclaim OA column to susceptibility to dewetting in 100% aqueous conditions. The Acclaim OA column maintains consistent retention of organic acids while the conventional C18 phase exhibits a significant decrease in retention.



Column	Acclaim OA, 5 µm
Dimensions	4.6 × 150 mm
Mobile phase	1% trifluoroacetic acid, pH 1/CH_3CN, v/v 50/50
Temperature	50 °C
Flow rate	1 mL/min
Inj. volume	5 µL
Detection	UV, 254 nm
Analyte	Toluene

Figure 2. The Acclaim OA column has hydrolytic stability at low pH conditions of pH 1. Peak retention, asymmetry, and efficiency are stable even after 30 days of operation at these extreme conditions.

Figure 1 illustrates the ability of the Acclaim OA column to maintain consistent retention and efficiency with 100% aqueous mobile phases under stop-flow conditions. The use of stop-flow conditions illuminates the ability of a bonded phase to maintain performance with 100% aqueous mobile phases. With stop-flow testing, when the pressure to the column is eliminated, the stationary phase tends to expel the polar mobile phase and self-associate or dewet. This phenomenon is illustrated by comparing the performance of the Acclaim OA column with a conventional reversed-phase C18 column. The unique polar-embedded chemistry of the Acclaim OA column resists dewetting and the associated irreproducible chromatographic results.

Enhanced pH stability

Organic acids have enhanced reversed-phase retention when acidic mobile phases are used. Many HPLC columns exhibit decreased column life, under these conditions, due to cleavage of the bonded phase by acidic mobile phases. This hydrolysis by the mobile phase results in frequent column replacement and instrument downtime. The proprietary bonding of the Acclaim OA column resists hydrolytic attack by protecting the bonded phase at low-pH conditions. Figure 2 illustrates the hydrolytic stability of the Acclaim OA column at pH 1. Retention, peak asymmetry, and efficiency are maintained even after prolonged use. Figure 3 shows the durability and reproducibility of the Acclaim OA column operated at pH 2.68 to facilitate maximum retention of important hydrophilic aliphatic organic acids.

Wide range of applications

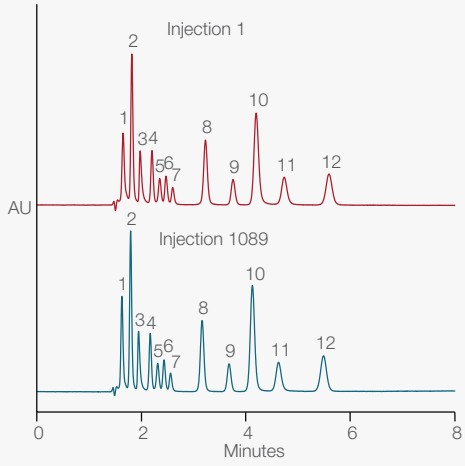
The Acclaim OA column is the recommended column for determining small hydrophilic organic acids, C1 to C7 aliphatic acids, as well as hydrophilic aromatic acids. The Acclaim OA column is valuable for the analysis and quality assurance of food and beverage products, pharmaceutical preparations, plating baths for semiconductor manufacturing, manufacturing chemicals, and chemical intermediates.

Key Acclaim OA column applications include:

- Aliphatic organic acids in foods
  - Orange juice
  - White wine
  - Sports drinks
  - Fresh lemon juice
  - Juice drink blends
- Organic acids in drug preparations
- C1-C7 aliphatic organic acids
- Acrylic acid and its oligomers
- Hydroxybenzoic acids
- Hydroxyphenylacetic acids
- Arylacetic acids
- Benzenepolycarboxylic acids
- Selected amino acids

Flexible methods development

Because the Acclaim OA column can be operated at low pH with 100% aqueous buffers, as well as with organic solvents, many mobile phase options are available to optimize your organic acid separations. Modifying the pH of the mobile phase, as illustrated in Figure 4, allows resolution and retention control.



Column	Acclaim OA, 5 µm
Dimensions	4.6 × 150 mm
Mobile phase	40 mM Na_2SO_4, pH 2.68 (adjusted with methanesulfonic acid)
Temperature	30 °C
Flow rate	1 mL/min
Inj. volume	5 µL
Detection	UV, 210 nm
Peaks	1. Oxalic acid 15 mg/L (ppm) 2. Tartaric acid 120 mg/L (ppm) 3. Formic acid 180 mg/L (ppm) 4. Malic acid 120 mg/L (ppm) 5. iso-Citric acid 120 mg/L (ppm) 6. Lactic acid 180 mg/L (ppm) 7. Acetic acid 120 mg/L (ppm) 8. Citric acid 120 mg/L (ppm) 9. Succinic acid 120 mg/L (ppm) 10. Fumaric acid 3 mg/L (ppm) 11. cis-Aconitic acid* 12. trans-Aconitic acid* * 3 ppm total for cis and trans isomers

Figure 3. The Acclaim OA column maintains resolution and retention of hydrophilic organic acids after long-term operation using 100% aqueous acidic mobile phase conditions.

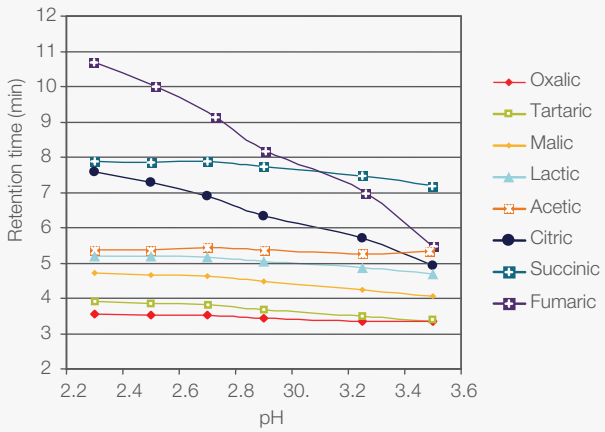
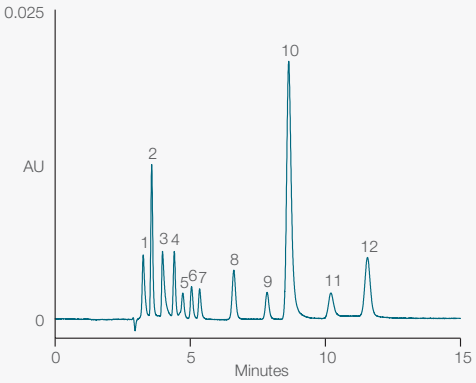


Figure 4. Retention and resolution of hydrophilic aliphatic organic acids can be optimized by mobile phase pH. For aliphatic organic acid profiling, a 40–100 mM buffer at pH of 2.65 is optimal.



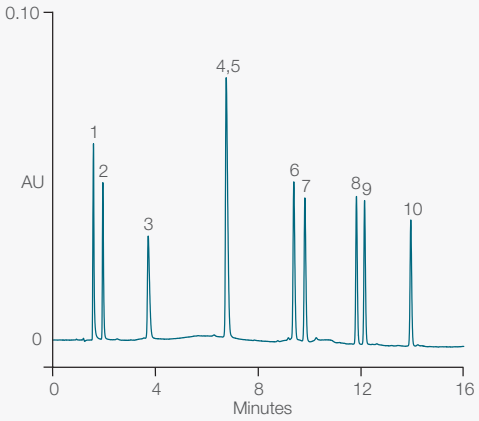
Column	Acclaim OA, 5 µm
Dimensions	4.0 × 250 mm
Mobile phase	100 mM Na_2SO_4, pH 2.65 (adjusted with methanesulfonic acid)
Temperature	30 °C
Flow rate	0.6 mL/min
Inj. volume	5 µL
Detection	UV, 210 nm
Peaks	1. Oxalic acid 15 mg/L (ppm) 2. Tartaric acid 120 mg/L (ppm) 3. Formic acid 180 mg/L (ppm) 4. Malic acid 120 mg/L (ppm) 5. iso-Citric acid 120 mg/L (ppm) 6. Lactic acid 180 mg/L (ppm) 7. Acetic acid 120 mg/L (ppm) 8. Citric acid 120 mg/L (ppm) 9. Succinic acid 120 mg/L (ppm) 10. Fumaric acid 7 mg/L (ppm) 11. cis-Aconitic acid* 12. trans-Aconitic acid* * 7 ppm total for cis and trans isomers

Figure 5. The Acclaim OA column is use-tested to guarantee separation of hydrophilic organic acids. These operating conditions provide a good starting point for methods development.

Very polar organic acids have excellent retention in 100% aqueous buffers, as illustrated in Figures 5 and 6. With the addition of a high performance liquid chromatography (HPLC) solvent such as acetonitrile, highly retained aliphatic and aromatic organic acids can easily be eluted with excellent peak shapes. See Figures 7, 8, 9, and 10.

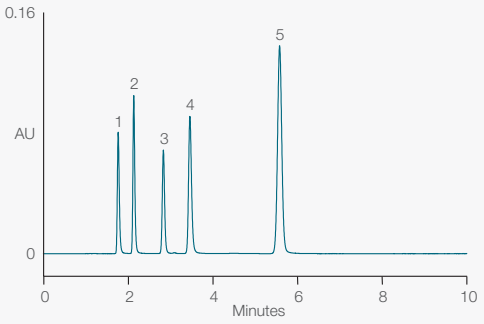
Ideal for quality assurance

If you use traditional reversed-phase HPLC with UV-visible detection for uncharged molecules plus organic acids, the Acclaim OA columns will give you unparalleled performance. Reversed-phase chromatography allows direct injection without sample preparation other than simple dilution of the product or reaction solution. Samples containing anionic surfactants or anionic dyes cannot be analyzed using anion exchange with conductivity detection but are readily determined using the Acclaim OA column with UV detection.



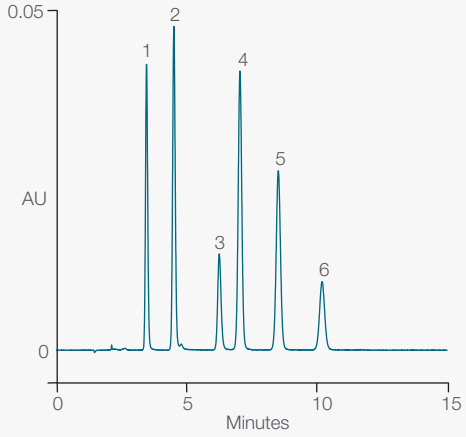
Column	Acclaim OA, 5 µm
Dimensions	4.0 × 150 mm
Mobile phase	A: CH_3CN, B: 2.5 mM methanesulfonic acid
Gradient	Hold B for 1 min B to A/B (45/55) in 11 min Hold A/B (45/55) for 4 min
Temperature	30 °C
Flow rate	1.0 mL/min
Inj. volume	15 µL
Detection	UV, 210 nm
Peaks	(10 mM each) 1. Formic acid 2. Acetic acid 3. Propionic acid 4. Butyric acid 5. Isobutyric acid 6. Isovaleric acid 7. n-Valeric acid 8. Isocaproic acid 9. n-Caproic acid 10. Heptanoic acid

Figure 6. The Acclaim OA column can easily retain and separate C1 to C7 volatile aliphatic acids using an aqueous low-pH mobile phase coupled with an acetonitrile gradient to elute the higher-molecular-weight organic acids.



Column	Acclaim OA, 5 µm
Dimensions	4.0 × 150 mm
Mobile phase	CH_3CN/5 mM methanesulfonic acid, v/v 30/70
Temperature	30 °C
Flow rate	0.75 mL/min
Inj. volume	5 µL
Detection	UV, 230 nm
Peaks	(80 ppm each) 1. 3,4,5-Trihydroxybenzoic acid 2. 3,5-Dihydroxybenzoic acid 3. 4-Hydroxybenzoic acid 4. 2,5-Dihydroxybenzoic acid 5. Benzoic acid

Figure 7. Separation of hydroxybenzoic acids on the Acclaim OA column with an acetonitrile mobile phase at low pH.



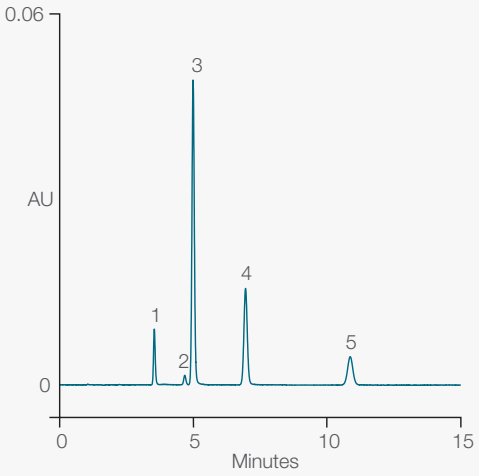
Column	Acclaim OA, 5 µm
Dimensions	4.0 × 150 mm
Mobile phase	CH_3CN/5 mM methanesulfonic acid, v/v 12.5/87.5
Temperature	30 °C
Flow rate	0.75 mL/min
Inj. volume	10 µL
Detection	UV, 230 nm
Peaks	(30 ppm each) 1. 2,5-Dihydroxyphenylacetic acid 2. 3,4-Dihydroxyphenylacetic acid 3. Mandelic acid 4. p-Hydroxyphenylacetic acid 5. m-Hydroxyphenylacetic acid 6. o-Hydroxyphenylacetic acid

Figure 8. Separation of closely related hydroxyphenylacetic acids on the Acclaim OA column with an acetonitrile mobile phase at low pH.

The sensitivity for the Acclaim OA column methods is in the low-mg/L (ppm) range. For organic acid determinations requiring trace-level (µg/L) sensitivity, consider Thermo Scientific anion-exchange with conductivity detection, ion chromatography mass spectrometry (IC-MS) or liquid chromatography mass spectrometry (LC-MS).

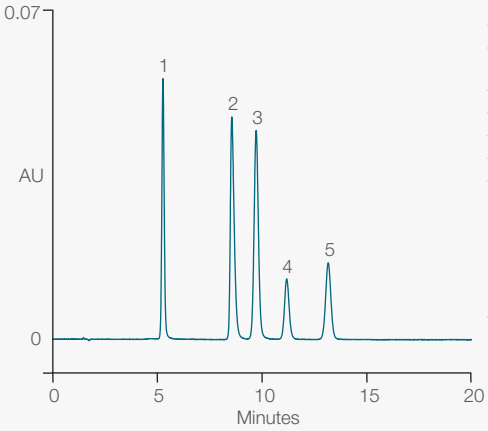
Quality assurance for foods and beverages

Figures 11, 12, 13, and 14 show the analysis of a range of foods and beverages for organic acids. Figure 15 shows that amino acids can be retained and separated. This separation can be useful for analysis of organic acids and selected amino acids in samples such as beers and wine. For many beverage samples, sample preparation was simple with a 2× dilution and matrix removal using an Thermo Scientific™ OnGuard™ P polyvinylpyrrolidone resin cartridge (OnGuard II P) for removal of aromatic compounds in the matrix.



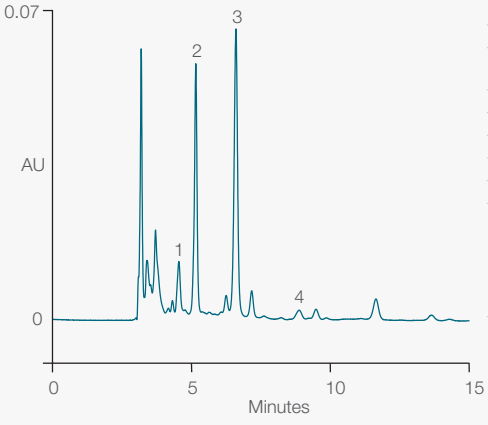
Column	Acclaim OA, 5 µm
Dimensions	4.0 × 150 mm
Mobile phase	CH_3CN/5 mM methanesulfonic acid, v/v 40/60
Temperature	30 °C
Flow rate	0.75 mL/min
Inj. volume	5 µL
Detection	UV, 240 nm
Peaks	(50 ppm each) 1. Phenylacetic acid 2. Hydrocinnamic acetic acid 3. trans-Cinnamic acid 4. 1-Naphthalene acetic acid 5. Diphenylacetic acid

Figure 9. Separation of arylacetic acids on the Acclaim OA column with an acetonitrile mobile phase at low pH.



Column	Acclaim OA, 5 µm
Dimensions	4.0 × 150 mm
Mobile phase	CH_3CN/5 mM methanesulfonic acid, v/v 12.5/87.5
Temperature	30 °C
Flow rate	0.75 mL/min
Inj. volume	5 µL
Detection	UV, 230 nm
Peaks	(50 ppm each) 1. 1,2,3-Benzenetricarboxylic acid 2. 1,2-Benzenedicarboxylic acid 3. 1,3,5-Benzenetricarboxylic acid 4. 1,4-Benzenedicarboxylic acid 5. 1,3-Benzenedicarboxylic acid

Figure 10. Separation of benzenepolycarboxylic acids on the Acclaim OA column with an acetonitrile mobile phase at low pH.



Column	Acclaim OA, 5 µm
Dimensions	4.0 × 250 mm
Mobile phase	0.1 M Na_2SO_4, pH 2.68 (adjusted with methanesulfonic acid)
Temperature	30 °C
Flow rate	0.6 mL/min
Inj. volume	5 µL
Detection	UV, 210 nm
Sample prep	OnGuard II P, diluted 2× with D.I. H_2O
Peaks	(50 ppm each) 1. Malic acid 2. Ascorbic acid (Vitamin C) 3. Citric acid 4. Fumaric acid

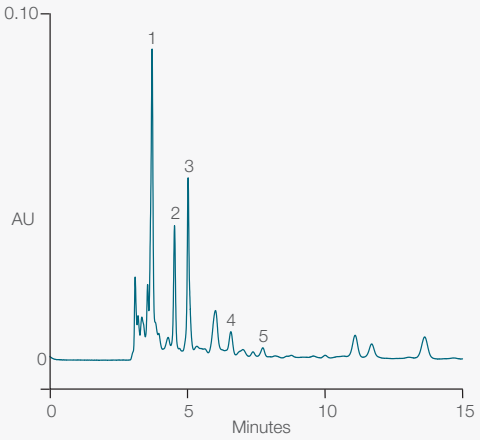
Figure 11. Analysis of orange juice for organic acids on the Acclaim OA column.

Quality assurance for pharmaceuticals

Pharmaceuticals may require the determination of the organic acid counter ions or preservatives in the drug formulations. Figure 16 illustrates the determination of the counter ions in an over-the-counter cough syrup using a 100% aqueous buffer on the Acclaim OA column.

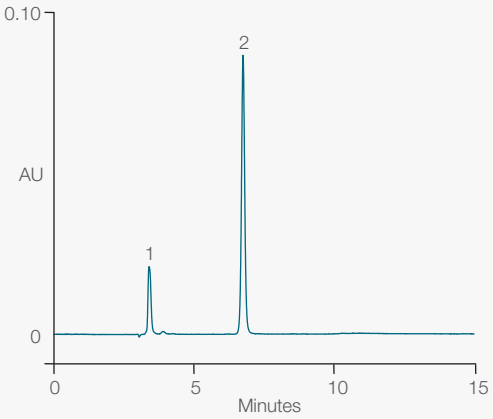
Quality assurance and monitoring of chemicals, chemical reaction mixtures, and chemical intermediates

Acclaim OA columns have the flexibility to be used for the determination of organic acids in environmental samples, manufacturing chemicals, and chemical process samples. Figure 17 illustrates the use of the Acclaim OA column for the characterization of acrylic acid and its oligomers using an acetonitrile gradient at acidic pH.



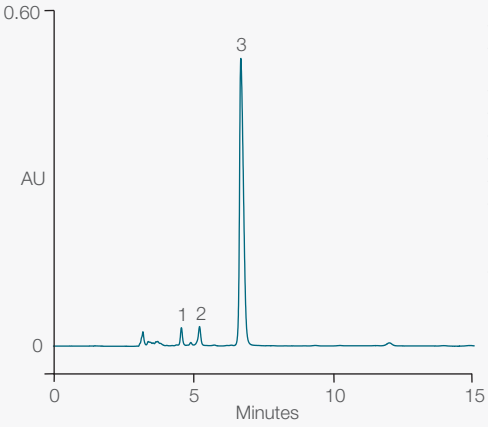
Column	Acclaim OA, 5 µm
Dimensions	4.0 × 250 mm
Mobile phase	0.1 M Na_2SO_4, pH 2.68 (adjusted with methanesulfonic acid)
Temperature	30 °C
Flow rate	0.6 mL/min
Inj. volume	5 µL
Detection	UV, 210 nm
Sample prep	OnGuard II P
Peaks	1. Tartaric acid
	2. Malic acid
	3. Lactic acid
	4. Citric acid
	5. Succinic acid

Figure 12. Analysis of white wine for organic acids on the Acclaim OA column.



Column	Acclaim OA, 5 µm
Dimensions	4.0 × 250 mm
Mobile phase	0.1 M Na_2SO_4, pH 2.68 (adjusted with methanesulfonic acid)
Temperature	30 °C
Flow rate	0.6 mL/min
Inj. volume	5 µL
Detection	UV, 210 nm
Sample prep	OnGuard II P
Peaks	1. Unknown
	2. Citric acid

Figure 13. Analysis of sports drink for organic acids on the Acclaim OA column.

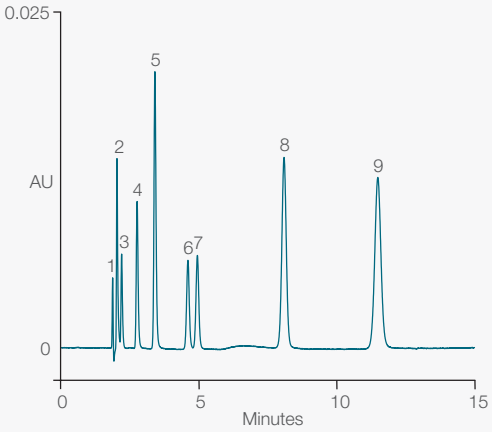


Column	Acclaim OA, 5 µm
Dimensions	4.0 × 250 mm
Mobile phase	0.1 M Na_2SO_4, pH 2.68 (adjusted with methanesulfonic acid)
Temperature	30 °C
Flow rate	0.6 mL/min
Inj. volume	5 µL
Detection	UV, 210 nm
Sample prep	OnGuard II P, diluted 2× with D.I. H_2O
Peaks	1. Malic acid
	2. Ascorbic acid (Vitamin C)
	3. Citric acid

Figure 14. Analysis of fresh lemon juice for organic acids on the Acclaim OA column.

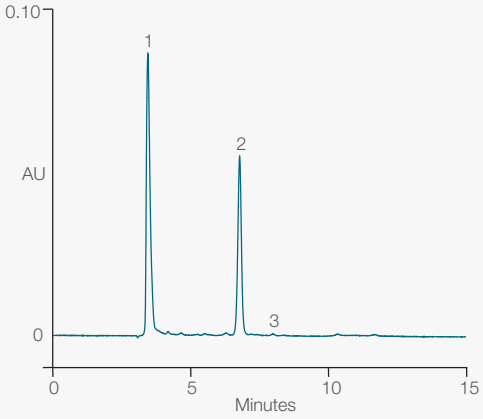
Manufacturing reproducibility

Each Acclaim OA column is manufactured to stringent specifications to ensure column-to-column reproducibility. Each column is shipped with a lot validation sheet showing the test results and specifications for the lot of bonded silica packed into the column and an individual test chromatogram validating performance for organic acid selectivity. The lot validation tests include a chromatography-based metals test and organic acids resolution tests. Production columns are individually tested for capacity and efficiency, and closely monitored for metals contamination.



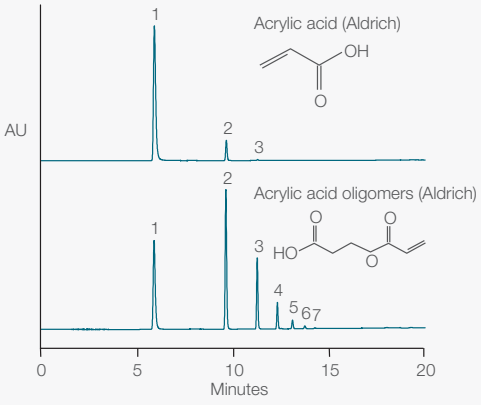
Column	Acclaim OA, 5 µm
Dimensions	4.0 × 150 mm
Mobile phase	40 mM Na_2SO_4, pH 2.65 (adjusted with methanesulfonic acid)
Temperature	30 °C
Flow rate	0.6 mL/min
Inj. volume	10 µL
Detection	UV, 210 nm
Peaks	1. Lysine
	2. Threonine
	3. Proline
	4. Valine
	5. Methionine
	6. Isoleucine
	7. Leucine
	8. Tyrosine
	9. Phenylalanine

Figure 15. Determination of amino acids on the Acclaim OA column using a 40 mM aqueous buffer at pH 2.65 with UV detection.



Column	Acclaim OA, 5 µm
Dimensions	4.0 × 250 mm
Mobile phase	0.1 M Na_2SO_4, pH 2.68 (adjusted with methanesulfonic acid)
Temperature	30 °C
Flow rate	0.6 mL/min
Inj. volume	5 µL
Detection	UV, 210 nm
Sample prep	OnGuard II P
Peaks	1. Bromide (Dextromethorphan HBr)
	2. Citrate (Inactive ingredient)
	3. Succinate (Doxylamine succinate)

Figure 16. Determination of acidic counter ions in a cough syrup on the Acclaim OA column. The inorganic anion, bromide, can also be determined by UV detection in the same chromatographic run.



Column	Acclaim OA, 5 µm
Dimensions	4.0 × 250 mm
Mobile phase	A: CH_3CN, B: 2.5 mM methanesulfonic acid
Gradient	Hold 5% A for 1 min, then increase to 90% A in 19 min
Temperature	30 °C
Flow rate	0.75 mL/min
Inj. volume	5 µL
Detection	UV, 210 nm
Sample prep	Diluted 1000× with D.I. H_2O
Peaks	1. Monomer
	2. Dimer
	3. Trimer
	4. Tetramer
	5. Pentamer
	6. Hexamer
	7. Heptamer

Figure 17. Characterization of acrylic acid and its oligomers on the Acclaim OA column.

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Acclaim OA column specifications

Specifications	
Phase	Reversed-phase with a proprietary polar-embedded group
Particle size	5 µm
Pore size	120 Å
Surface area	300 m^2/g
pH range	2–8
Silica	Type B, high-purity, low metal

Ordering information

Column	Format	Particle size (µm)	Length (mm)	ID (mm)	Part number
Acclaim OA	Analytical	3.0	150	2.1	070087
			150	3.0	070086
		5.0	150	4.0	062903
			250	4.0	062902
	Guard		10	4.6	069700
			10	3.0	071987

Acclaim Guard Holder ordering information

Guard holder	Part number
Thermo Scientific™ Acclaim™ Guard Cartridge Holder V-2	069580
Thermo Scientific™ Acclaim™ Guard Kit (Holder and coupler) V-2	069707
Guard to Analytical Column Coupler V-2	074188

Expect reproducible results with sample prep, columns and vials

Don't see what you need? We would be happy to discuss your specific requirements. Please contact your local sales representative for custom orders.

Find out more at **thermofisher.com/acclaim**

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