

Astec CLC-L and CLC-D

Copper Ligand Exchange HPLC Columns for Chiral Separation of Acids and Amines

Astec CLC columns use the copper ligand concept described by Davankov to effect enantiomer separation (1). The method uses a small, chiral bidentate ligand and a copper sulphate-containing mobile phase. The copper ions coordinate with the chiral selector on the stationary phase and functional groups on the analytes to form transient diastereomeric complexes in solution. The technique also has the advantage of giving small acids with no UV chromophore a strong 254 nm signal.

Astec CLC columns are ideal for analysis of α -hydroxy acids, like lactic, malic, tartaric, and mandelic acids, amino acids, other amines, and bifunctional racemates, like amino alcohols. Two versions of the column provide elution order reversal (see Figure). On the Astec CLC-D column, the L enantiomer generally elutes before D, with the exception of tartaric acid. The reverse is true on the Astec CLC-L column where D elutes before L. Proline and aspartic acid are particularly suited for low-level detection on the CLC column since the copper complex is detected at 254 nm UV. Both can be resolved on the Astec CLC-D or CLC-L in 5 mM CuSO_4 with the usual reversal of elution order from the CLC-D to CLC-L. In theory, any analyte that can complete the coordination with the copper ion can be resolved.

Features:

- Separates α -hydroxy carboxylic acids, amino acids, and other α -bifunctional compounds
- High selectivity with simple mobile phases
- Copper complex gives strong UV 254 nm signal
- Simple reversal of elution order, CLC-L vs. CLC-D

Application Areas:

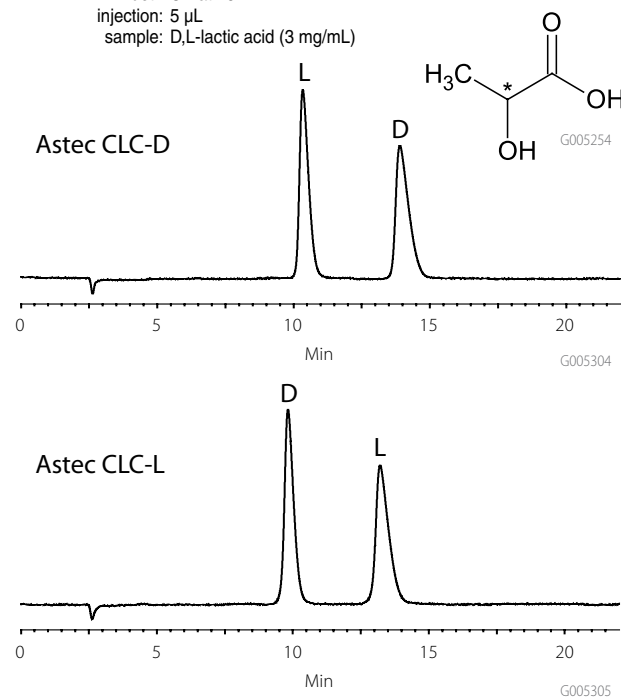
- α -hydroxy acids
- lactic, malic, tartaric, and mandelic acids
- amino acids
- amines
- bifunctional racemates, like amino alcohols

Properties:

- Bonded phase: Chiral bidentate ligand (L and D forms)
- Operating pH range: 3 - 6 (adjust pH of the 5 mM CuSO_4 mobile phase with acetic acid)
- Particle type: High-purity spherical silica
- Particle diameter: 5 μm
- Pore size: 100 \AA

Reversal of Elution Order of Lactic Acid Enantiomers on Astec CLC-L and CLC-D

columns: Astec CLC-D (53023AST) and Astec CLC-L (53123AST), both 15 cm x 4.6 mm I.D., 5 μm particles
 mobile phase: 5 mM CuSO_4
 flow rate: 1.0 mL/min.
 temp.: ambient
 det.: UV at 254 nm
 injection: 5 μL
 sample: D,L-lactic acid (3 mg/mL)



Method Development and Optimization Protocols for Astec CLC Columns

For the ligand exchange process to occur, the mobile phase must contain 1 to 10 mM copper sulfate (CuSO_4). The recommended starting mobile phase is 20% methanol in 5 mM CuSO_4 .

Optimization Parameters and Guidelines:

Parameter	Relationship	Range
CuSO_4 Concentration	Retention is inversely proportional to the CuSO_4 concentration	1 to 10 mM
% Organic modifier	Retention is inversely proportional to the % of organic modifier	Methanol – up to 30%, Ethanol – up to 20%, Isopropanol – up to 15%
Temperature	Retention is inversely proportional to temperature	5 – 40 °C
pH	Retention is proportional to the pH	pH 3 to pH 6

Part of the Astec Family of Chiral HPLC, GC, and SFC Columns:

- Astec CHIROBIOTIC® – Macrocyclic Glycopeptides for Chiral HPLC
- Astec CYCLOBOND™ – Native and Derivatized Cyclodextrins for Chiral HPLC
- Astec P-CAP™ – Polycyclic Amine Polymers for Chiral HPLC
- Astec Cellulose DMP – Rugged and Economical Derivatized Cellulose for Chiral HPLC and SFC
- Astec CLC – Ligand Exchange for Chiral HPLC
- Astec CHIRALDEX® and Supelco DEX™ – Derivatized Cyclodextrins for Chiral GC

Ordering Information

Description	Cat. No.
Astec CLC-D, 15 cm x 4.6 mm I.D., 5 μm particles	53023AST
Astec CLC-L, 15 cm x 4.6 mm I.D., 5 μm particles	53123AST

Please visit sigma-aldrich.com/chiral to view our comprehensive product offering for chiral chromatography and chiral chemistry.

Reference

1. Davankov, V. A.; Rogozhin, S. V. Ligand chromatography as a novel method for the investigation of mixed complexes: Stereoselective effects in α -amino acid copper(II) complexes. *J. Chrom.* 1971, 60, 280-283.

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