GC Capabilities

Updated: June 10, 2014

Agenda
Why Use GC?
How Does GC Work?
Who Uses GC?
Workflow Overview
Our Offering
Resources
Summary / Our Message

sigma-aldrich.com/analytical
## Why Use GC?

### Applicability (GC vs. HPLC)

<table>
<thead>
<tr>
<th>GC</th>
<th>HPLC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher <strong>efficiency</strong> (resolves more compounds per unit time)</td>
<td>Can adjust mobile phase polarity to fine tune separation</td>
</tr>
<tr>
<td>More <strong>universal</strong> (analytes do not have to have a chromophore)</td>
<td>Analytes must have a chromophore</td>
</tr>
<tr>
<td>Generally <strong>simpler</strong> to use; instruments are usually <strong>less expensive</strong></td>
<td>More amenable to polar, non-volatile, and thermally labile compounds (most biochemicals, drugs, and metabolites)</td>
</tr>
<tr>
<td>Analytes must vaporize in injection port (derivatization can increase volatility)</td>
<td>Analyte must dissolve in mobile phase</td>
</tr>
<tr>
<td>Analytes must be thermally stable (not degrade at high temperature)</td>
<td>Non-destructive (can be used for preparative separations)</td>
</tr>
</tbody>
</table>

GC is an analytical technique used to separate compounds for identification and/or quantification.
How Does GC Work?
Summary of the Technique

• Sample introduced into injector, then vaporized

• Vaporized compounds carried into and through column by carrier gas (helium, hydrogen, nitrogen, etc.)

• Compounds partition between column stationary phase and carrier gas

• Strength of compound-stationary phase interaction determines retention time

• Oven temperature can be altered to influence these strengths

• At column outlet, detector creates a signal when compounds pass by
How Does GC Work?
Example GC Chromatogram

A chromatogram is the result of a GC separation.
## Who Uses GC?

<table>
<thead>
<tr>
<th>Testing Labs</th>
<th>Industries</th>
<th>Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental</td>
<td>Petroleum</td>
<td>Academic</td>
</tr>
<tr>
<td>Industrial Hygiene</td>
<td>Biofuel</td>
<td>Government</td>
</tr>
<tr>
<td>Petroleum</td>
<td>Chemical</td>
<td>Hospital</td>
</tr>
<tr>
<td>Biofuel</td>
<td>Agriculture</td>
<td></td>
</tr>
<tr>
<td>Chemical</td>
<td>Food and Beverage</td>
<td></td>
</tr>
<tr>
<td>Agriculture</td>
<td>Flavor and Fragrance</td>
<td></td>
</tr>
<tr>
<td>Food and Beverage</td>
<td>Cosmetic and Personal Care/Cleaning Product</td>
<td></td>
</tr>
<tr>
<td>Flavor and Fragrance</td>
<td>Pharmaceutical</td>
<td></td>
</tr>
<tr>
<td>Cosmetic and Personal Care/Cleaning Product</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pharmaceutical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forensic</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Workflow Overview
Three Distinct Areas

Workflow Areas:
- GC Columns
- GC Accessories
- Gas Purification/Management

Gas Supply (cylinder or generator)
Gas Delivery & Purification
Autosampler Tray and Tower
Injection Port
Detector (MS or non-MS)
GC Oven (column inside)
Data Collection (chart recorder or PC)

We offer many consumables to serve this entire technology workflow.
We do not offer bottled gas (but we do offer regulators and other gas delivery items).

sigma-aldrich.com/gc
A GC column is the heart of a GC system (where the chromatographic separation occurs).
Our Offering
GC Columns – Cross Section of a Capillary Column

Polyimide coating
(provides flexibility and strength)

Fused silica tubing
(similar to fiber optic tubing)

Stationary phase – the “chemistry”
(thin layer applied to inside wall)

Our columns are coiled into a cage/basket (typically 6-8” in diameter).
Our Offering
GC Columns – Product Lines

• Over 80 different column chemistries
• Each with a different combination of retention mechanisms (selectivity)
• Can serve many industries and applications

• Our ionic liquid GC columns represent a new column platform
• Benefits
  – Unique selectivity
  – Better phase stability

Visit sigma-aldrich.com/gc-columns for more information.
Our Offering
GC Accessories

GC accessories: 1) help get samples into the GC column
2) help with detection or data collection.
Our Offering
GC Accessories – Product Lines

• Injection port items
  – Septa, inlet liners, glass wool, o-rings, inlet seals

• Autosampler items
  – Syringes, vials

• Column installation items
  – Ferrules, nuts, cutters, connectors, flowmeters

• Detector and instrument items
  – PID lamps, cleaning brushes, split vent traps

• Data collection items
  – Ink cartridges, recorder pens, chart paper

Visit sigma-aldrich.com/gc-accessories for more information.
Our Offering
Gas Purification/Management

Gas Supply
(cylinder or generator)

Gas Delivery & Purification

Gas purification/management items help ensure a clean mobile phase (carrier gas).
Our Offering
Gas Purification/Management – Product Lines

• Gas generation
  – Gas generators, air compressors

• Gas delivery
  – Tubing, cutters, reamers, benders, fittings, shutoff valves, leak detectors

• Gas purification
  – Polishing purifiers, contaminant traps (remove hydrocarbons, moisture, oxygen, carbon dioxide), gas purifiers (clean helium), filters (remove particles, oil)

• Gas management
  – Pressure regulators, flow regulators

Visit sigma-aldrich.com/gaspurifiers for more information.
Our Offering
Related Product Lines

• Purge and Trap
  – Purge traps, glassware

• Solid Phase Microextraction
  – Fiber assemblies, holders, field samplers

• Analytical Standards
  – Neat, single-component, multi-component

• GC Solvents
  – Pesticide, headspace, high res mass spec, general

• GC Derivatization Reagents
  – Silylation, acylation, alkylation/esterification

Visit sigma-aldrich.com/gc for more information.
Resources

• GC Columns
  – Mike Buchanan
  – GC Column Selection Guide (T407133 KCX)
  – sigma-aldrich.com/gc-columns

• GC Accessories, Syringes, Vials, and Gas Purification/Management
  – Jaime Martain
  – Maximize Performance brochure (T407103 JWE)
  – sigma-aldrich.com/gc-accessories
  – sigma-aldrich.com/gaspurifiers
Summary / Our Message

• Full selection of nearly every consumable a GC user needs (do not offer bottled gas)

• Columns and accessories ideal for GC and GC-MS

• Offer all types of columns, but focus on special purpose columns

• Our new ionic liquid columns are truly innovative, solve some important problems, and are being used for some valuable separations

If you have a GC, we can help!
Fluka site
Buchs (Switzerland)
Thank You!