Unsurpassed extraction technology
accelerated solvent extraction
Thermo Scientific Dionex ASE 150 and 350 Systems
Sample extraction with walk-away capability to produce uncompromised results

The Thermo Scientific™ Dionex™ ASE™ 150/350 Accelerated Solvent Extractor systems are for laboratories seeking to spend minimal time and effort to extract samples for chromatographic analysis.

Increase laboratory productivity and sample throughput

The Dionex ASE 150/350 systems improve productivity by using a combination of elevated temperature and pressure to increase the efficiency of the extraction process. The result is faster extraction times with a significant reduction in solvent use when compared to traditional extraction techniques such as Soxhlet or sonication. Other extraction techniques can take up to 48 hours per sample while the Dionex ASE 150/350 system extractions are typically performed in 12–20 minutes. Solvent consumption is reduced by 50–90% when compared with traditional extraction techniques.

Innovative sample preparation solutions to optimize the laboratory workflow

Sample preparation is the most vital part of the laboratory workflow. Since greater than 60% of all errors occur during this phase, it is often considered the most frustrating and cumbersome component of the workflow. While analytical technology has evolved remarkably over the last 20 years, most sample preparation still relies on antiquated manual techniques that can produce low sample recovery with highly variable reproducibility.

A traditional sample preparation workflow consists of extraction, cleanup, and evaporation, all of which use manual sample transfer steps through the transfer. Techniques such as Soxhlet, gel permeation chromatography, and nitrogen blowdown evaporation often produce total sample prep workflow times in excess of 60 hours per batch.

In 1995, the Dionex ASE 200 was introduced and substantially reduced extraction time. More recently, we introduced the Dionex ASE system with In-Cell Cleanup and Thermo Scientific™ Rocket™ Evaporator to address the entire sample preparation workflow and reduce the total time to six hours per sample batch.

The combination of the Dionex ASE system with In-Cell Cleanup and the Rocket Evaporator provides a total sample preparation solution for the analytical laboratory. The combination of these two techniques eliminates both the manual cleanup step and manual sample transfer resulting in highly accurate and reproducible sample preparation.

Sample Preparation Productivity *

<table>
<thead>
<tr>
<th>Technique</th>
<th>Average Extraction Times*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soxhlet</td>
<td>4–48 h</td>
</tr>
<tr>
<td>Automated Soxhlet</td>
<td>1–4 h</td>
</tr>
<tr>
<td>SFE</td>
<td>0.5–1 h</td>
</tr>
<tr>
<td>Microwave</td>
<td>0.5–1 h</td>
</tr>
<tr>
<td>Dionex ASE 150/350</td>
<td>0.2–0.3 h</td>
</tr>
</tbody>
</table>

Solvent Savings

<table>
<thead>
<tr>
<th>Technique</th>
<th>Solvent Usage*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soxhlet</td>
<td>150–500 mL</td>
</tr>
<tr>
<td>Automated Soxhlet</td>
<td>90–100 mL</td>
</tr>
<tr>
<td>SFE</td>
<td>5–50 mL</td>
</tr>
<tr>
<td>Microwave</td>
<td>25–90 mL</td>
</tr>
<tr>
<td>Dionex ASE 150/350</td>
<td>5–200 mL</td>
</tr>
</tbody>
</table>

*Calculated on a per sample basis

Why compromise analytical results with cumbersome and ineffective sample extraction techniques?
Inside the system

The Dionex ASE 150/350 systems use patented technology that automatically performs solvent extractions.

Extraction cells filled with sample are loaded into an oven where they are heated, pressurized. The cell is held at a preset temperature for a fixed period of time for a static extraction. A static valve is then opened to release the extract into the collection vessel and then is closed in preparation for a second static extraction. The number of static extraction cycles is programmable and once complete, the extraction cell is flushed and purged with nitrogen.

Through use of the static extraction cycles, the accelerated solvent extraction technique ensures an exhaustive extraction in a manner that uses much less solvent and time. Since analytes diffuse out of the matrix and into the extraction solvent, static extraction cycles maximize the concentration gradient that permits this movement and results in highly efficient extractions. This results in high percent recoveries for analytes of interest in a diverse array of solid matrices with extraction times as low as 12 minutes per sample with a little as 5 ml of solvent used for each extraction.

The Dionex ASE 150/350 systems work with both stainless steel and Dionex extraction cells. Dionex cells permit the use of samples that require pretreatment with acids and bases and bring the benefits of the system to several new applications for food and renewable fuel source analysis.

Performance and productivity beyond traditional sample preparation techniques or procedures

Dionex ASE 150/350 systems deliver greater capabilities

The Dionex ASE 150 is the entry-level ASE system designed for use in lower throughput labs. This system offers fast and efficient extraction for a large range of sample sizes.

Key features include:
- Automated extraction for a single sample
- Small footprint that requires less than 96 cm (34 in) of bench space
- Preprogrammed extraction methods to facilitate ease of use
- pH hardened Pathways for acid and base pretreated samples

The Dionex ASE 350 is designed for high-throughput labs with large sample testing requirements. It is ideal for the busy environmental, food analysis, chemical, pharmaceutical or research labs.

Key features include:
- Unattended extraction of up to 24 samples
- Automated in-cell solvent mixing for complex extractions
- Thermo Scientific™ Chromelox™ 7 Chromatography Data System (CDS) software control for compliance and to simplify automation
- Collection vessels (60 mL) can be directly transferred to the Rocket Evaporator
- Stores 24 extraction methods and 24 extraction sequences for unmatched flexibility

In-Cell Clean Up

The extraction cells used by both the Dionex ASE 150 system and Dionex ASE 350 system make use of several adsorbents that perform in Cell clean up. Interfering compounds can be selectively removed through the addition of reagents such as activated alumina and florisil. Use of these adsorbents may require the need to offline gel permeation chromatography procedures. More detailed information can be found in Thermo Scientific Technical Note 210.
### Analyte Class (EPA Analysis Method)

<table>
<thead>
<tr>
<th>Analyte Class</th>
<th>MDLa (mg/kg)</th>
<th>Accuracy (% Recovery of CRM)</th>
<th>Recovery as a % of Soxhlet</th>
<th>Precision (RSD%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organochlorine pesticides (8081) (average of 30 compounds)</td>
<td>0.5–3.2</td>
<td>66–84</td>
<td>75–105</td>
<td>3.2</td>
</tr>
<tr>
<td>PCBs (Aroclor 1254, 8042)</td>
<td>57–70</td>
<td>99</td>
<td>96.3</td>
<td>3.5</td>
</tr>
<tr>
<td>Total Petroleum Hydrocarbons (8015)</td>
<td>5.1</td>
<td>104.1</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Organophosphorus Pesticides (8141) (average of 24 compounds)</td>
<td>18.9–171</td>
<td>96–72</td>
<td>90–111</td>
<td>16.3</td>
</tr>
<tr>
<td>Chlorinated Herbicides (8151) (average of 8 compounds)</td>
<td>22–261</td>
<td>98–69</td>
<td>101–118</td>
<td>15.5</td>
</tr>
<tr>
<td>Sulfonilureas (8179) (average of 56 compounds)</td>
<td>16–89</td>
<td>58–70</td>
<td>86–130</td>
<td>9.4</td>
</tr>
<tr>
<td>Dichlor (B190/B396)</td>
<td>Low ppt</td>
<td>79%</td>
<td>96</td>
<td>4.24%</td>
</tr>
</tbody>
</table>

- **CRM** = certified reference material
- *Calculated as per SW-846 chapter 1.
- †Average recovery of duplicates
- ‡Stated method
- §Average RSD of Compounds

### Environmental

For environmental applications, Dionex ASE 150/350 systems are proven to produce data equivalent to or better than traditional extraction techniques such as Soxhlet or saturation. Accelerated solvent extraction technique is accepted under U.S. EPA Method 3544A for the extraction of the following compounds from soil, sludge, tissue, and sediments:

- Pesticides and Herbicides
- Polyaromatic Hydrocarbons
- Polychlorinated Biphenyls
- Dehydro and Furans
- Total Petroleum Hydrocarbons
- Explosive Compounds

The Dionex ASE 150/350 system is also accepted for use in U.S. EPA Method 8360 for the determination of pentachlorophenol and Contract Laboratory Program (CLP) Organic Low Medium (OLM) 04 2A for semivolatile and pesticides. The accelerated solvent extraction technique has also proven effective in extracting organic compounds from air using polyurethane foam filters (PUF) and XAD resin.

### Food and Beverage

The accelerated solvent extraction technique is used for multiple applications in the food and beverage industry. The Dionex ASE 150/350 systems are capable of extracting large gram weight samples with high moisture content to support the low detection limits required for food analysis and delivers optimal extractions for the following applications:

- Pesticide residues in a variety of sample types marketed for human or animal consumption
- Fats and oils using acid hydrolysis
- Fats and total lipids using alkaline saponification
- Acrylamide
- Antioxidant residues
- Antibiotics

### Pharmaceutical and Natural Product Industries

- Monitoring the level of pharmaceutical agents and their metabolites in tissue to assess stability
- Verifying the level of active compounds in products such as transdermal patches are within specification
- Verifying that natural products such as St. John’s Wort, Echinacea, and ginseng biloba meet industry guidelines for standardized market compounds

Automation and improved reproducibility result in better control of manufacturing processes and faster identification of potential therapeutic agents.

### Chemical, Petrochemical, and Renewable Fuel Sources

The Dionex ASE 150/350 systems have a diversity of uses in the plastics, rubber, and textile industries including:

- Extraction of plastiizers from PVC
- Extraction of polystyrene and polyethylene for additives (UV stabilizers and antistaticants)
- Extraction of oils and organic acids from styrene butadiene rubber (ASTM D 1-146)

### Extraction of Marker Compounds from Natural Products

- Dianthrones (St. John’s Wort)
- Deacylsaponins (Horse Chestnut)
- Silybin (Milk Thistle)
- Curcumin (Tumeric Rhizome)
- Thymol (Thyme)

### Extraction Parameters

- Technique: Soxhlet
- Reflux: Yes
- ASE: Yes

### Extraction Sample Parameters

- Method: Soxhlet
- Reflux: Yes
- ASE: Yes

### Extraction Solvents

- DCM
- Acetone
- DCM
- MeOH
- DCM
- MeOH
- DCM
- MeOH
- MeOH
- MeOH
- MeOH
- Water

### Extraction Target Values

- Value: 32.59
- Value: 32.60
- Value: 33.86
- Value: 34.83

### Weight Percent of Each Plastizer in Poly Vinyl Chloride (PVC)

<table>
<thead>
<tr>
<th>Plastizer</th>
<th>ASE Recovery (%)</th>
<th>Soxhlet Recovery (ASTM D2124) (%)</th>
<th>ASE Recovery (% vs. Target value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOA</td>
<td>9.81</td>
<td>9.56</td>
<td>103.6</td>
</tr>
<tr>
<td>TOP</td>
<td>9.50</td>
<td>9.28</td>
<td>102.4</td>
</tr>
<tr>
<td>DOP</td>
<td>9.42</td>
<td>9.35</td>
<td>102.7</td>
</tr>
<tr>
<td>TOTM</td>
<td>9.17</td>
<td>9.05</td>
<td>101.3</td>
</tr>
</tbody>
</table>

### Extraction Additives from Low Density Polyethylene (LDPE)

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Additive Concentration (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorinated</td>
<td>i-3144</td>
</tr>
<tr>
<td>I-3101</td>
<td>95</td>
</tr>
<tr>
<td>I-1330</td>
<td>98</td>
</tr>
<tr>
<td>I-1668</td>
<td>99</td>
</tr>
<tr>
<td>I-1706</td>
<td>99</td>
</tr>
</tbody>
</table>

### Extraction Additives from High Density Polyethylene (HDPE)

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Additive Concentration (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM D-6953-11</td>
<td>353</td>
</tr>
<tr>
<td>1314</td>
<td>1310</td>
</tr>
<tr>
<td>1330</td>
<td>1368</td>
</tr>
<tr>
<td>1376</td>
<td>1376</td>
</tr>
<tr>
<td>ASTM D-6953-11</td>
<td>353</td>
</tr>
<tr>
<td>1314</td>
<td>1310</td>
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<td>1376</td>
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</tbody>
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†Average recovery of duplicates
‡Stated method
§Average RSD of Compounds

*Accelerated solvent extraction technique
Total workflow solutions from Thermo Fisher Scientific

**Dionex ASE 150/350 Systems**
Automated accelerated solvent extractor systems. Enables extraction of solid and semisolid samples using common solvents at elevated temperatures and pressures.

**Rocket Synergy 2 Evaporator**
A revolutionary solvent evaporator that concentrates or dries up to 18 ASE vials or 6 large-volume flasks unattended.

**Thermo Scientific™ Dionex™ AutoTrace™ 280 Solid-Phase Extraction (SPE) Instrument**
Automated SPE instrument that extracts large-volume samples (20 mL - 4 L) for the isolation of trace organics in aqueous matrices. Produces analyte recoveries that are superior to manual liquid-liquid extraction techniques using less time and solvent.

**Thermo Scientific™ TRACER™ 1300 Series GC Systems**
The first and only gas chromatograph featuring user-exchangeable miniaturized, instant connect injectors and detectors that eliminate maintenance downtime and enable the user to quickly tailor instrument capability to specific applications and daily workload.

**Thermo Scientific™ TSQ™ 9000 Evo Triple Quadrupole GC-MS/MS System**
A reliable, easy-to-use system that enables faster, more precise, error-free analyses, saving time and reducing laboratory costs. It enables more precise routine analyses and offers unstoppable productivity with uncompromised MS/MS simplicity.

**Thermo Scientific™ Vanquish™ HPLC and UHPLC Systems**
Designed with innovative technology and attention to fine detail, Vanquish HPLC and UHPLC systems are the most advanced LC instruments available. The Vanquish systems improve performance and repeatability with no trade-offs in quality, robustness, or ease-of-use. Regardless of which Vanquish HPLC or UHPLC system is used, chromatographers have all they need to solve their toughest analytical challenges with confidence.

**Chromeleon CDS Software**
One scalable software platform for LC, GC, IC and MS that provides Operational Simplicity™ by streamlining your entire analysis process — ultimately boosting your lab’s overall productivity, simplifying compliance and increasing the quality of your analytical results.

The collective power of chromatography

**Lead your lab with SP**

Impactful ion chromatography is about so much more than just the final result. It’s about how you got there. How easy it was. How fast it was. And most importantly, it’s about how much confidence you have in your result. For over 40 years, Thermo Fisher Scientific has been a leader of ion chromatography solutions perfecting these key attributes by developing instruments, chemistries and applications for your needs today and in the future. With the largest portfolio of IC solutions, we remain a steadfast and committed partner in your endeavor to improve the world around us.

Find out more at [thermofisher.com/chromatography](http://thermofisher.com/chromatography)