Thermo Scientific
HyperSep Dispersive
SPE Products

Efficient sample preparation and clean-up using the QuEChERS Method
The QuEChERS method overcomes the problems associated with time consuming, expensive and labor intensive multiresidue methods (MRM).

QuEChERS stands for Quick, Easy, Cheap, Effective, Rugged and Safe. The method, developed in 2003 by Anastassiades and Lehotay, is becoming the method of choice by many for food analysis.

- High sample throughput
- Determination of a large number of pesticide compounds
- No laborious steps and no need for automation
- Less solvent usage than conventional MRM’s
- Detection of wide pesticide range (polars, pH-dependent compounds)
- Extraction in acetonitrile – GC and LC amenable
- High recovery levels and accurate results

Our comprehensive range of Dispersive SPE products contain the proper sorbents for optimum extraction, clean-up and separation of analytes from complex matrices such as food using QuEChERS methods.

- Save valuable time in preparation – products are supplied pre-prepared
- Reduced variability due to consistency in products and rigorous quality control
- Cleaner extracts from cleaner, pre-prepared products
- Lower peak counts as a result of using pre-prepared products

For non-base sensitive compounds, such as bendiocarb and diuron using the original QuEChERS method:

1. Add 15mL of acetonitrile to QuEChERS centrifuge tube
2. Shake to mix contents.
3. Add surrogate or internal standards if necessary*
4. Add 15g of homogenised hydrated sample and shake for 1 minute
5. Centrifuge tube for 1 minute at 3700 rcf
6. Add an aliquot of the supernatent to the appropriate clean-up tube (and shake for 1 minute)
7. Centrifuge for 1 minute at 3700 rcf
8. Analyse extract

- 50mL PP centrifuge tube: 60105-211
- 2mL or 15mL clean-up tubes:
  - 60105-202
  - 60105-203
  - 60105-204
  - 60105-205
  - 60105-206
  - 60105-223
  - 60105-224
  - 60105-225
  - 60105-226
For base sensitive compounds such as folpet and fungicides using the AOAC 2007.01 QuEChERS method:

1. Add 15mL of 1% acetic acid in acetonitrile to QuEChERS centrifuge tube
2. Shake to mix contents
3. Add surrogate or internal standards if necessary*
4. Add 15g of homogenised hydrated sample and shake for 1 minute
5. Centrifuge tube for 1 minute at 3700 rcf
6. Add an aliquot of the supernatent to the appropriate clean-up tube and shake for 1 minute
7. Centrifuge for 1 minute at 3700 rcf
8. Analyse extract

For non-base sensitive compounds using the European EN15662 Method:

1. Weigh 15g of homogenised (hydrated at least 80%) sample in a 50mL centrifuge tube
2. Add 15mL acetonitrile (or 1:1 acetone/hexane, ethyl acetate) and IS
3. Shake briefly
4. Add 6g anhydrous magnesium sulfate, 1.5g sodium chloride, 1.5g sodium citrate Tribadic dihydroyte, 0.75g sodium citrate dibasic
5. Shake by hand for 1 minute
6. Centrifuge at 5,000 rpm for 5 minutes
7. Transfer a portion of supernatent to a QuEChERS clean up tube
8. Shake for 30 seconds
9. Centrifuge for 1 minute at 6,000 rpm

For polar aromatic (planar) compounds such as matrix plant pigments using the Schenck Method:

1. Pre-rinse the cartridge with 5mL of toluene
2. Add an aliquot of the supernatent to the cartridge
3. Start collection
4. Elute with 6-12mL of 3:1 acetone :toluene
5. Concentrate for GC/MS analysis - or -
6. Concentrate to dryness and reconstitute in mobile phase for LC analysis

- 50mL PP centrifuge tube: 60105-210
- 2mL or 15mL clean-up tubes: 60105-202 60105-203 60105-204 60105-205 60105-206 60105-223 60105-224 60105-225 60105-226
- 6mL columns: 60105-207 60105-208 60105-209

* Surrogate or internal standards may be required if subsequent analysis is required. We offer a complete range of standards – visit www.thermoscientific.com for more information
**Considerations in Method Development**

1. Determine the properties of the sample matrix:

<table>
<thead>
<tr>
<th>Matrix Type</th>
<th>Examples</th>
<th>Sorbent Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Matrices</strong></td>
<td>Apples • Cucumber • Melon</td>
<td>MgSO4, PSA</td>
</tr>
<tr>
<td><strong>Fatty Matrices</strong></td>
<td>Milk • Cereals • Fish</td>
<td>MgSO4, PSA, C18</td>
</tr>
<tr>
<td><strong>Pigmented Matrices</strong></td>
<td>Lettuce • Carrot • Wine</td>
<td>MgSO4, PSA, C18, GCB</td>
</tr>
<tr>
<td><strong>High Pigmented Matrices</strong></td>
<td>Spinach • Red Peppers</td>
<td>MgSO4, PSA, C18, GCB</td>
</tr>
</tbody>
</table>

2. Determine the properties of the pesticides of interest:

- **Base sensitive**
- **pH dependent**
- **Non-base sensitive**

**Troubleshooting**

<table>
<thead>
<tr>
<th>Problem</th>
<th>Causes</th>
<th>Recommended Solutions</th>
</tr>
</thead>
</table>
| Loss of planar pesticides                    | Presence of GCB may result in a loss of planar compounds                | • Use a product with less GCB  
• Use the Dual Phase QuEChERS product         |
| Loss of acidic compounds e.g. 2,4-D from starting matrix | Presence of PSA will extract acidic compounds from matrix                | • Use a product containing MgSO4 and C18                                               |
| Loss of compounds during subsequent analysis | Some compounds are unstable and can break down during analysis          | • Use an analyte protectant e.g. toluene or sorbitol                                    |
| Addition of sample to QuEChERS Extraction tube containing sorbent causes an exothermic reaction | Exothermic reaction between water in sample and MgSO4                    | • Add the sample to the tube, then the solvents, m then the sorbent materials           |
| Poor recovery of pesticide compounds         | • Sample not in appropriate homogenisation state  
• Wrong products used in method                | • Ensure sample is hydrated to 80% or higher  
• Verify nature of pesticides e.g. are base sensitive compounds present                |
Thermo Scientific HyperSep Dispersive SPE products are available in a range of sorbent material combinations. Each of the sorbent materials is used to remove different interferences from the starting sample. The table below shows the different sorbent materials used and the compounds they are used to target.

### Extraction Tubes

<table>
<thead>
<tr>
<th>Size</th>
<th>Contents</th>
<th>Application</th>
<th>Quantity</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>50mL</td>
<td>6g Anhydrous Magnesium Sulfate, 1.5g Anhydrous Sodium Acetate</td>
<td>This product is listed in the AOAC for the extraction of pesticide residues using the QuEChERS method. Primarily designed to preserve base sensitive compounds such as chlorothalonil, dichlofluanid, tolyfluanid, folpet, captan, captafol from non-acidic matrices.</td>
<td>250 per pack</td>
<td>60105-210</td>
</tr>
<tr>
<td></td>
<td>4g Anhydrous Magnesium Sulfate, 1g Sodium Chloride</td>
<td>This product is used for the extraction of pesticide residues using the QuEChERS method. It is preferred when base sensitive compounds are not present or are not of analytical interest. Eliminating the buffer allows a cleaner extract, and sodium chloride aids in the extraction of the analytes.</td>
<td></td>
<td>60105-211</td>
</tr>
<tr>
<td></td>
<td>6g Anhydrous Magnesium Sulfate, 1.5g Sodium Chloride, 1.5g Sodium Citrate Tribasic Dihydrate, 750mg Sodium Citrate Dibasic Sesquihydrate</td>
<td>This product is the European version of 60105-210 and is used for the extraction of pesticide residues. It is preferred when base sensitive compounds are not an issue.</td>
<td></td>
<td>60105-212</td>
</tr>
<tr>
<td></td>
<td>4g Anhydrous Magnesium Sulfate, 1g Sodium Chloride, 1g Sodium Citrate Tribasic Dihydrate, 500mg Sodium Citrate Dibasic Sesquihydrate</td>
<td></td>
<td></td>
<td>60105-216</td>
</tr>
</tbody>
</table>

### Columns

<table>
<thead>
<tr>
<th>Size</th>
<th>Contents</th>
<th>Application</th>
<th>Quantity</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6mL</td>
<td>200mg graphatized carbon on top, 400mg PSA on bottom, separated by a Teflon frit</td>
<td>Used in the Schenck variation of QuEChERS, this product removes pigments, polar organic acids, some sugars and lipids from an aliquot of extract.</td>
<td>30 per pack</td>
<td>60105-207</td>
</tr>
<tr>
<td></td>
<td>250mg graphatized carbon on top, 500mg PSA on bottom, separated by a Teflon frit</td>
<td>Schenck variation of QuEChERS, but with a different quantity of sorbents. When in doubt, use 60105-208.</td>
<td></td>
<td>60105-208</td>
</tr>
<tr>
<td></td>
<td>500mg graphatized carbon on top, 500mg PSA on bottom, separated by a Teflon frit</td>
<td></td>
<td></td>
<td>60105-209</td>
</tr>
</tbody>
</table>

The Schenck variation of QuEChERS introduces the use of PSA and graphatized carbon block to remove high levels of chlorophyll and plant sterols in the final extract without loss of planar pesticides using an acetone : toluene solvent mix (3:1).

**LC Columns and Consumables**

As a leader in HPLC column technology including silica manufacturing, bonded phase production and column packing, you can rely on Thermo Scientific HPLC products. For over 30 years our innovation has pioneered the market with advanced products such as our Hypersil GOLD columns offering outstanding peak shape and consistent results.

**GC Columns and Consumables**

Thermo Scientific TRACE GC Columns offer high temperature stability and exhibit low bleed and long lifetimes. From general purpose non-polar to polar columns, many of which are MS-compatible, TRACE™ GC columns provide excellent quality and performance, with guaranteed results.

**Reagents and Standards**

We offer a wide range of high quality GC/HPLC reagents and solvents, which include:

- Silylation, Alkylation and Acylation reagents for GC derivatisation
- HPLC/GC Grade Solvents
- HPLC detection reagents for pre- and post-chromatographic techniques. All compounds and formulations are purified for chromatography, minimizing artefact formation.
## Clean-Up Tubes

<table>
<thead>
<tr>
<th>Size</th>
<th>Contents</th>
<th>Application</th>
<th>Quantity</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>15mL</td>
<td>900mg Anhydrous Magnesium Sulfate, 300mg PSA &amp; 150mg Carbon</td>
<td>Removing polar organic acids, some sugars and lipids. This product will cause the loss of planar pesticides.</td>
<td>50 per pack</td>
<td>60105-205</td>
</tr>
<tr>
<td></td>
<td>900mg Anhydrous Magnesium Sulfate, 300mg PSA &amp; 150mg endcapped C18</td>
<td>Removing polar organic acids, sterols, some sugars and lipids.</td>
<td>60105-206</td>
<td></td>
</tr>
<tr>
<td></td>
<td>750mg Anhydrous Magnesium Sulfate, 250mg PSA, 250mg endcapped C18 &amp; 250mg Carbon</td>
<td>Removing polar organic acids, some sugars and lipids.</td>
<td>60105-213</td>
<td></td>
</tr>
<tr>
<td></td>
<td>900mg Anhydrous Magnesium Sulfate &amp; 300mg PSA</td>
<td>Removing polar organic acids, some sugars and lipids which may cause some loss of planar pesticides.</td>
<td>60105-214</td>
<td></td>
</tr>
<tr>
<td></td>
<td>900mg Anhydrous Magnesium Sulfate &amp; 150mg PSA &amp; 45mg Carbon</td>
<td>Removing polar organic acids, some sugars and lipids which may cause some loss of planar pesticides.</td>
<td>60105-217</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1200mg Anhydrous Magnesium Sulfate &amp; 400mg PSA</td>
<td>Removing polar organic acids, some sugars and lipids.</td>
<td>60105-218</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1200mg Anhydrous Magnesium Sulfate, 400mg PSA &amp; 400mg endcapped C18</td>
<td>Removing polar organic acids, sterols, some sugars and lipids.</td>
<td>60105-224</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1200mg Anhydrous Magnesium Sulfate, 400mg PSA, 400mg endcapped C18 &amp; 400mg Carbon</td>
<td>Removing polar organic acids, sterols, some sugars and lipids.</td>
<td>60105-225</td>
<td></td>
</tr>
<tr>
<td></td>
<td>900mg Anhydrous Magnesium Sulfate, 150mg PSA &amp; 50mg Carbon</td>
<td>Removing polar organic acids, some sugars and lipids which may cause some loss of planar pesticides.</td>
<td>60105-226</td>
<td></td>
</tr>
<tr>
<td></td>
<td>900mg Anhydrous Magnesium Sulfate, 150mg PSA &amp; 150mg Chlorofiltr</td>
<td>Removal of chlorophyll.</td>
<td>60105-227</td>
<td></td>
</tr>
<tr>
<td></td>
<td>150mg Anhydrous Magnesium Sulfate, 25mg PSA &amp; 25mg endcapped C18</td>
<td>Removing polar organic acids, some sugars and lipids. aliquot of supernatent</td>
<td>50 per pack</td>
<td>60105-219</td>
</tr>
<tr>
<td></td>
<td>150mg Anhydrous Magnesium Sulfate, 25mg PSA &amp; 25mg endcapped C18 &amp; 25mg Carbon</td>
<td>Removing polar organic acids, sterols, some sugars and lipids.</td>
<td>100 per pack</td>
<td>60105-220</td>
</tr>
<tr>
<td></td>
<td>150mg Anhydrous Magnesium Sulfate, 25mg PSA &amp; 2.5mg Carbon</td>
<td>Removing polar organic acids, some sugars and lipids which may cause some loss of planar pesticides</td>
<td>60105-221</td>
<td></td>
</tr>
<tr>
<td></td>
<td>150mg Anhydrous Magnesium Sulfate, 25mg PSA &amp; 7.5mg Carbon</td>
<td>Removing polar organic acids, some sugars and lipids which may cause some loss of planar pesticides</td>
<td>60105-222</td>
<td></td>
</tr>
<tr>
<td></td>
<td>150mg Anhydrous Magnesium Sulfate, 50mg PSA, 50mg endcapped C18 &amp; 50mg Carbon</td>
<td>Removing polar organic acids, sterols, some sugars and lipids.</td>
<td>60105-223</td>
<td></td>
</tr>
<tr>
<td></td>
<td>150mg Anhydrous Magnesium Sulfate, 50mg PSA &amp; 50mg Carbon</td>
<td>Removing polar organic acids, some sugars and lipids.</td>
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<td></td>
<td>150mg Anhydrous Magnesium Sulfate, 50mg PSA &amp; 50mg endcapped C18</td>
<td>Removing polar organic acids, some sugars and lipids which may cause some loss of planar pesticides.</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>150mg Anhydrous Magnesium Sulfate, 50mg PSA &amp; 50mg endcapped C18</td>
<td>Removing polar organic acids, sterols, some sugars and lipids.</td>
<td>60105-226</td>
<td></td>
</tr>
</tbody>
</table>

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**North America:** USA/Canada +1 866 984 3766 (866-9-THERMO)  
**Europe:** Austria +43 1 801 40 0, Belgium +32 2 482 30 30, France +33 2 2803 2180, Germany national toll free 08001-536 376, Germany international +49 6184 90 6940, Italy +39 02 02 95059, Netherlands +31 76 571 4440, Nordic/Baltic countries +358 9 329 100, Russia/CIS +7 (812) 703 42 15, Spain/Portugal +34 93 223 09 18, Switzerland +41 44 454 12 12, UK/Ireland +44 870 609 9203  
**Asia:** China +86 21 6865 4588 or +86 10 8419 3588, India toll free 1800 22 8374, India +91 22 6716 2200, Japan +81 45 453 9220, Other Asian countries +852 2885 4613  
**Countries not listed:** +49 6184 90 6940 or +33 2 2803 2180  

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