

Chemical Testing

What's In Your Compound?

ARDL's chemical services laboratory specializes in analyzing composite rubber along with thermoset and thermoplastic material compounds. A full range of services is available, from single compound identification to complete analysis and theoretical formula reconstruction.

Why Perform Such a Detailed Analysis?

Complex analysis performed at ARDL, such as the chemical reconstruction of an elastomeric material, can aid you in:

- Assuring the quality of ingredients in your material
- Finding the root cause of catastrophic or premature failure
- Reducing the cost of material development
- Supporting you during forensic investigation and litigation
- Enabling you to keep up with your competitors
- Eliminating product performance variations
- Investigating possible patent infringement
- Determining ingredients for FDA approval
- Ensuring specification compliance
- Verifying the approval and acceptance of imported goods by US Customs

ARDL is an independent laboratory and will identify the root cause of failure, regardless of its origin, and will assist you in rectifying the problem.



Rubber. Plastic. Latex.

Example: Typical Rubber Compound Analysis & Carbon Black Typing

| | |
|--|--|
| Date: January 4, 2008 | |
| Attention: Rubber Development Manager Company: American Rubber, Inc. Address: 5500 Washington Blvd. West Farmington, OH 44491 | Compd. ID: Gasket 1453 Compd. Color: Black Project No: PN 99999 PO No: ARC 13256 |
| A. Polymer Identification..... Wt% <i>(Infrared Spectroscopy)</i> 1. Nitrile Rubber 100% (32% Acrylonitrile Content) 2. 3. | H. Extractables..... 8.3% <i>(ASTM D297)</i> 1. Color.....Amber 2. Consistency..... Semi-Solid |
| B. Ash Content; D2972.80% | I. Carbon Black 33.3% 1. ASTM Type..... N500 Series |
| C. Semi-Quantitative Ash Analysis <i>(Atomic Absorption)</i> a. >10%.....Zn b. 5-25% c. 1-10% d. 0.5-5% e. 0.1-1% f. 0.05-0.5%..... Ca, Mg, Fe g. 0.01-0.1%.....Si i. Not detected..... Al, Pb, Ba, Cu, Ti | J. Extract Analysis 1. Plasticizers; D2702 a. Dioctyl Phthalate b. c. 2. Antioxidants; D3156 a. Aminox b. c. 3. Accelerators <i>(Suggested)</i> a. MBT or MBTS b. TMTD or TMTM c. |
| D. Total Hydrocarbon.....55.9% | K. Beilstein Negative <i>(Presence of Halogens)</i> |
| E. Total Sulfur.....1.61% <i>(Leco Sulfur Determinator)</i> | L. Shore A Hardness 72 |
| F. Density 1.193 Mg/m³ | |
| G. Nitrogen Content.....4.70% | |

What information will a chemical analysis provide me with?

- | | |
|---|--|
| <ul style="list-style-type: none"> • Accelerators – Qualitative Only • Antioxidant Identification • Carbon Black Content • Halogen Presence • Percent Ash • Percent Total Extract • Plasticizer Identification | <ul style="list-style-type: none"> • Polymer/Polymer Blend Identification • Rubber Hydrocarbon Content • Semi-Quantitative Ash Analysis (Filler Types and Percents) • Specific Gravity • Theoretical Formula Reconstruction • Total Sulfur Content |
|---|--|

Example: Reconstructed Formulation

| Ingredient | PHR | Extract. | Ash | Volume |
|--------------------------|--------------|-------------|------------|--------------|
| Nitrile Rubber (32% ACN) | 100.0 | 1.0 | | 101.0 |
| N500 Series Carbon Black | 57.0 | | | 31.7 |
| Zinc Oxide | 5.0 | | 5.0 | 0.9 |
| Dioctyl Phthalate | 8.5 | 8.5 | | 8.9 |
| Stearic Acid | 1.0 | 1.0 | | 1.2 |
| Aminox | 2.0 | 2.0 | | 1.7 |
| Misc. Extractables* | 2.0 | 2.0 | | 2.2 |
| MBT or MBTS | 1.5 | 0.3 | | 1.0 |
| TMTD or TMTM | 0.4 | 0.1 | | 0.3 |
| Sulfur | 1.2 | | | 0.6 |
| Totals | 178.6 | 14.9 | 5.0 | 149.5 |

* May contain wax, processing aids, etc...

| | |
|-------------------------------|-------------------------|
| Calculated Ash Content..... | 2.8% |
| Calculated Carbon Black..... | 33.3% |
| Calculated Density | 1.195 Mg/m ³ |
| Calculated Extractables | 8.3% |

Note: Reconstructed formulation is based on analytical data from your sample. The above calculated percentages are based on the reconstructed formulation.

To further enhance and more exactly match an unknown material, the following tests can be performed at an additional charge:

- | | |
|---|--|
| <ul style="list-style-type: none"> • Acrylonitrile Content • Antioxidant/Antiozonant Quantification • Carbon Black Typing • Free Sulfur Content • Fiber Identification | <ul style="list-style-type: none"> • Halogen Content Analysis • Pyrolysis GC/MS • Resin Identification • Thermal Analysis (DSC, DMA, TMA) • Wax Content |
|---|--|

Order Form

Please Provide Sample Description (10 Grams Requested): _____

Please Indicate Tests To Be Performed:

Standard Analysis\$785.00

Complete Analysis (Extract Analysis)\$1,980.00

| | Optional Tests | Individual Prices | Standard Analysis | Complete Analysis |
|--|----------------------------------|-------------------|-------------------|-------------------|
| <input type="checkbox"/> | % ACN (In Total Sample) | \$395.00 | \$220.00 | \$220.00 |
| <input type="checkbox"/> | % Ash | \$110.00 | Included | Included |
| <input type="checkbox"/> | Beilstein (Cl or Br) | \$30.00 | Included | Included |
| <input type="checkbox"/> | % Carbon Black | \$220.00 | Included | Included |
| <input type="checkbox"/> | Carbon Black Typing | \$450.00 | \$450.00 | \$450.00 |
| <input type="checkbox"/> | Density | \$60.00 | Included | Included |
| <input type="checkbox"/> | % Extractables | \$110.00 | Included | Included |
| <input type="checkbox"/> | Free Sulfur Content | \$220.00 | \$220.00 | \$220.00 |
| <input type="checkbox"/> | GC/MS - Qualitative* | \$440.00 | \$440.00 | Included |
| <input type="checkbox"/> | GC/MS - Quantitative | Consult Lab | Consult Lab | Consult Lab |
| <input type="checkbox"/> | Halogen Content | \$220.00 | \$220.00 | \$220.00 |
| <input type="checkbox"/> | Polymer Identification | \$170.00 | Included | Included |
| <input type="checkbox"/> | Pyrolysis GC/MS | \$350.00 | \$350.00 | \$350.00 |
| <input type="checkbox"/> | Qualitative Accelerator Analysis | \$785.00 | \$785.00 | Included |
| <input type="checkbox"/> | Resin ID | \$345.00 | \$320.00 | \$320.00 |
| <input type="checkbox"/> | % Rubber Hydrocarbon | \$275.00 | Included | Included |
| <input type="checkbox"/> | Semi-Quantitative Ash Analysis | \$275.00 | Included | Included |
| <input type="checkbox"/> | Total Sulfur | \$120.00 | Included | Included |
| <input type="checkbox"/> | Wax Content | \$165.00 | \$165.00 | \$165.00 |
| <small>*GC/MS - Qualitative Analysis includes plasticizer, antioxidant, antiozonant and additional processing aid identifications.</small> | | | | |

Total Price of Requested Testing \$ _____ \$ _____ \$ _____

TERMS: Purchase Order Required, NET 30 Days, FOB Akron, Ohio.

Prices Subject to Change Without Notice.

WARRANTY: All work proposed is on the basis of our best effort using good judgement and established standard laboratory practices and procedures where applicable. All work will be performed promptly and professionally. We offer no other warranties, written or implied.



2887 Gilchrist Rd. | Akron, Ohio 44305 | answers@ardl.com
 Toll Free (866) 778-ARDL | Worldwide (330) 794-6600 | Fax (330) 794-6610
 © 2007 Akron Rubber Development Laboratory, Inc. All Rights Reserved.