

Environmental

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Rapidly Analyze a Wide Range of Glycol Ethers by GC-MS Using the New Rxi®-1301Sil MS Column

Chromatographic conditions were developed for a fast GC-MS glycol ether analysis on the Rxi®-1301Sil MS column. This column provides better resolution and faster run times than the thick film cyanopropylphenyl-type columns commonly used for speciation of the glycol ethers.

Combined Determination of 1,4-Dioxane and Nitrosamine Contaminants in Drinking Water

Typically, 1,4-dioxane and nitrosamines are analyzed in drinking water following separate extraction and analysis procedures, such as Methods 521 and 522. However, here we present a combined method that uses large volume splitless injection and GC-MS (SIM) to meet low part-per-trillion detection limits for these compounds in a fraction of the time required when running separate methods.

Helium, Hydrogen, or Nitrogen—The Choice is Yours: Unique Rtx®-CLPesticides Column Set Provides Optimal Results for Organochlorine Pesticides GC-Micro-ECD Analysis Using Any Carrier Gas

Using an Rtx®-CLPesticides column set is the best strategy for labs considering alternate carrier gases as a way to reduce helium consumption. These columns have a unique selectivity and produce faster results than competitor columns when using either helium or hydrogen. In addition, only Rtx®-CLPesticides columns can be used with nitrogen, which give labs the freedom to choose the carrier gas option that is best for them.



A Guide to the Analysis of Halogenated Environmental Pollutants Using Electron Capture Detection

Analyses of halogenated pollutants can be difficult because samples often are contaminated with nontarget compounds and methods can require rigorous quality control. This technical guide covers sample extraction, cleanup, and GC-ECD analysis. Includes chromatographic analysis of chlorinated pesticides, PCBs, chlorinated herbicides, haloacetic acids and more on a single column set.

[Request free printed copies today.](#) (PDF - 3612kB)



Reduce Helium Consumption by 68% Using Nitrogen Purge Gas for VOCs in Water

Labs analyzing purgeable organic compounds in water can save money and reduce helium dependence by using Method 524.4 with nitrogen purge gas and an Rtx®-VMS column. By making the switch, you can reduce helium consumption by 68%, while meeting all Method 524.4 requirements. (PDF - 1464kB)

Half the Column, Same Chromatogram: Maintain Resolution of BDE 49 and BDE 71 With Proper Method Translation After Trimming an Rtx®-1614 Column for Maintenance

Column trimming can extend GC column lifetime when analyzing polybrominated diphenyl ethers (PBDEs); however, the method must be adapted to the shorter column length in order to maintain separation of critical congeners. Here we demonstrate that with proper method translation an Rtx®-1614 GC column can be trimmed nearly in half and still meet resolution requirements for BDE 49 and BDE 71.



Techniques for Optimizing GC Analysis of Ethylene Glycol in Water

Direct injections of water-based samples, such as samples containing ethylene glycol, can cause poor peak shape, sample carryover, and FID flameout. Avoid these problems using the chromatography tips described here. (PDF - 921kB)

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CLPesticides2 Columns

Rtx®-CLPesticides and Rtx®-CLPesticides2 columns are ideal for multiple environmental ECD methods. Here we demonstrate the effectiveness of this column pair for chlorinated pesticides, PCBs as Aroclors, chlorinated herbicides, and haloacetic acids. Includes EPA Methods 8081B, 8082A, 8151A, 504.1, 505, 508.1, and 552.2. Speed up your analyses and reduce downtime using the versatile Rtx®-CLPesticides/Rtx®-CLPesticides2 column pair in a dual column configuration. (PDF - 3972kB)



Ship Our Rugged Air Canisters at No Extra Cost

Air sampling canisters from Restek are durable, easy to use, and highly inert. They weigh just grams more than canisters from other vendors and cost the same to ship. Check out this weight and cost comparison to see for yourself! (PDF - 1795kB)



Improve Results for Chlorinated Pesticides With Resprep® CarboPrep® SPE Cleanup

Ensure cleaner sample extracts and obtain high recoveries of target pesticides by adding a Resprep® CarboPrep® SPE cleanup step when preparing samples for chlorinated pesticides analysis. (PDF - 1683kB)

Fingerprinting Crude Oils and Tarballs using Biomarkers and Comprehensive Two-Dimensional Gas Chromatography

Comprehensive two-dimensional gas chromatography time-of-flight mass spectrometry (GCxGC-TOFMS) was used to analyze petroleum biomarkers creating unique fingerprints of crude oil samples and tarballs collected after the Deepwater Horizon oil spill.



Improve GC Analysis of Extractable Petroleum Hydrocarbons Using Resprep® EPH Fractionation SPE Cartridges

New manufacturing and testing procedures for Resprep® EPH fractionation SPE cartridges reduce background levels of extractable contaminants and assure more reliable fractionation of aliphatics from aromatics. (PDF - 1279kB)

Rapid Determination of TO-15 Volatile Organic Compounds (VOCs) in Air

The efficacy of using a Nutech preconcentrator and a 30 m analytical column for VOC analysis of air samples according to Method TO-15 was evaluated. Results demonstrate that method criteria were easily met and in much faster analysis times than typical methods based on 60 m columns.



Restek Ultra-Clean Resin

Restek-exclusive Ultra-Clean resin is a great alternative to XAD®-2 resin for sampling semivolatiles. Learn more about how our GC-tested resin, as well as our polyurethane foam (PUF) plugs, can help you with your ambient, indoor, and industrial hygiene air-sampling applications. (PDF - 656kB)



New Rxi®-PAH GC Column; Resolve Important Isobaric Polycyclic Aromatic Hydrocarbons for Food Safety and Environmental Methods

Separate isobaric polycyclic aromatic hydrocarbons, including priority EFSA PAH4 compounds benz[a]anthracene, chrysene, benzo[b]fluoranthene, and benzo[a]pyrene, easily and accurately on an Rxi®-PAH column. Whether you need more resolution or faster analysis, these new GC columns offer the selectivity and efficiency you need for food safety and environmental PAH analysis. (PDF - 826kB)



A New Solution for Trace-Level Analysis of 1,4-Dioxane in Drinking Water: Large Volume Injection in an Unmodified Splitless GC Inlet

Quantify 1,4-dioxane in drinking water down to 5.0 ppt using a new approach. The technique described here uses an unmodified split/splitless GC inlet with concurrent solvent recondensation-large volume splitless injection (CSR-LVSI) to lower detection limits. This 8-page brochure details system setup, sample prep, and analysis. (PDF - 1812kB)

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pesticides. By using Florisil tubes for extract cleanup, background interferences can be reduced and recoveries can be improved. (PDF - 1182kB)



Introducing New Restek EPA 524.3 Certified Reference Materials

Restek has formulated the most complete set of EPA 524.3 reference standards for the monitoring of purgeable organic compounds in drinking water—using as few as three ampuls! This collection of certified reference materials (CRMs) also covers the seven volatile organic compounds (VOCs) included in UCMR3. (PDF - 1000kB)



Airmail, 2012 vol. 2

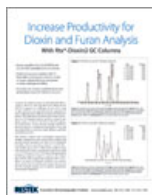
This issue of Airmail includes a fast, sensitive analysis of TO-15 volatiles on a 30 m column, as well as an update on opportunities for air labs to collaborate with the EPA to meet Agency measuring and monitoring needs. Also features Tedlar® bags. (PDF - 867kB)

Analysis of Trace Oxygenates in Petroleum-Contaminated Wastewater, Using Purge-and-Trap GC-MS (U.S. EPA Methods 5030B & 8260)

Determination of oxygenates in a gasoline-water matrix is difficult, because analytes such as MTBE and TBA coelute on many columns and share GC-MS identification ions. We developed a sensitive, accurate analysis using an Rtx®-VMS column and optimized conditions.

Lowering Detection Limits for 1,4-Dioxane in Drinking Water Using Large Volume Injection in an Unmodified Splitless GC Inlet

Concurrent solvent recondensation–large volume splitless injection (CSR-LVSI) typically requires a special GC inlet. The technique described here uses an unmodified split/splitless inlet with CSR-LVSI to lower detection limits for the analysis of 1,4-dioxane in drinking water.



Increase Productivity for Dioxin and Furan Analysis with Rtx®-Dioxin2 GC Columns

Rtx®-Dioxin2 columns have higher temperature stability (340 °C) than other confirmation columns and also provide isomer specificity for both 2,3,7,8-TCDD and 2,3,7,8-TCDF in a single column. These attributes allowed the Maxxam Analytics HR-MS group to make productivity improvements that resulted in their being honored with a Kaizen award. (PDF - 691kB)



Rxi®-624Sil MS Columns—Exceptionally Inert, Low Bleed Columns for Volatiles Analysis

Analyze volatile compounds and polar analytes with greater confidence using Rxi®-624Sil MS columns. Optimized selectivity, higher inertness, and lower bleed result in reliable separations and accurate, trace-level determinations. Includes environmental and pharmaceutical applications. (PDF - 311kB)



Restek Airmail, 2012 vol. 1

This 4-page newsletter includes an analysis of Massachusetts DEP air-phase petroleum hydrocarbons, as well as an update on the U.S. EPA Photochemical Assessment Monitoring Stations (PAMS) program. Also features Tedlar® bags and air canisters. (PDF - 774kB)

Large Volume Splitless Injection Using an Unmodified Split/Splitless Inlet and GC-TOFMS for Pesticides and Brominated Flame Retardants

Concurrent solvent recondensation large volume splitless injection (CSR-LVSI) GC/MS is used here for analyzing pesticides and brominated flame retardants in drinking water based on EPA Method 527. CSR-LVSI allows a time-consuming sample extract concentration step to be eliminated, but can also be used with extract concentration for lower detection limits.

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on the market. Take variation out of the equation and lower detection limits with highly inert, low bleed Rxi® gas chromatography columns. (PDF - 1992kB)

Avoid Resampling Soil Vapors: Confirm Tracer Gas in the Field Using a Leak Detector

Confirming sample port integrity with a leak detector is a simple, cost-effective alternative to lab analysis of tracer gas in vapor intrusion VOC samples. Prevent resampling of soil vapors by confirming sample port integrity in the field prior to sampling.

Seven EPA Methods on One Column Pair Using a micro-ECD

Get improved resolution, faster analyses, and less downtime by using Rtx®-CLPesticides and Rtx®-CLPesticides2 columns for multiple GC/ECD methods. Instead of changing columns between methods, you can save time by analyzing chlorinated pesticides, PCBs, herbicides, and other halogenated compounds on a single column set. Rtx®-CLPesticides and Rtx®-CLPesticides2 columns have a unique selectivity and outperform other column sets offered specifically for multiple GC/ECD methods.



Guide to Whole Air Canister Sampling

Ambient air sampling involves collecting a representative sample of ambient air for analysis. There are two general approaches: 1) "whole air" sampling with canisters or Tedlar® bags and 2) "in-field concentration" sampling using sorbent tubes or cold traps. In this guide, we focus on collecting whole air samples in canisters, a flexible technique with many applications. (PDF - 1408kB)

Optimized Volatiles Analysis Ensures Fast VOC Separations

Analytical conditions for GC analysis of volatile organic compounds have been optimized to ensure good resolution of critical pairs, while maximizing sample throughput. Rxi®-624Sil MS columns are shown to outperform other 624s.



Gas Sampling Bags: Cost-Effective Alternatives for Air Monitoring

Gas sampling bags can be a cost-effective alternative to canisters and thermal desorption tubes for many air monitoring applications, including VOCs and permanent gases. This 4-page flyer provides general guidelines, product specifications, and recommended applications. (PDF - 953kB)

New Wool Ensures More Accurate Semivolatiles Analyses

New Semivolatiles Wool, pre-packed in Restek liners, is designed specifically for semivolatiles analysis and result in more accurate results at lower levels, compared to similar products.

Analyze Haloacetic Acids in Under 13 Minutes with Rtx®-CLPesticides Columns

Sample throughput for haloacetic acids in drinking water can be increased significantly using Rtx®-CLPesticides/Rtx®-CLPesticides2 columns. Target HAAs were fully resolved in under 13 minutes.

3-Fold Faster Polybrominated Diphenyl Ether (PBDE) Short Column Method

Sample throughput for PBDE analysis can be significantly increased using a 15m Rtx®-1614 column. Excellent responses and peak shapes are obtained for all congeners, including BDE-209, in just 20 minutes.

Reliably Detect Pesticides Down to 10 pg with Sensitive SIM GC-MS Multiresidue Method

As labs operate in an extremely competitive market, the demand for more sensitive multiresidue pesticide methods is increasing. Here we demonstrate linearity down to 10 pg on-column for a wide range of pesticides differing in volatility, compound class, and degree of activity. The inertness of the Rxi®-5Sil MS column ensures linear performance and more accurate low-level quantification for multiresidue pesticide methods.

PTV On-Column Liner Gives You Two Inlets in One

Programmable temperature vaporization inlets are versatile, yet normally do not accommodate on-



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The Rtx[®]-Dioxin2 column has a unique selectivity for dioxins and furans, including specificity for 2,3,7,8-TCDD and 2,3,7,8-TCDF. Here we characterize all 136 tetra- through octachlorine dioxins and furans and define all possible coelutions. While commonly used cyanopropyl columns are limited by a low maximum operating temperature of 240°C, the Rtx[®]-Dioxin2 column is stable up to 340°C, extending column lifetime and improving the analyses of dioxins and furans.



Underground Storage Tanks: Compliance Monitoring with Restek Reference Standards

Restek develops reference standards for underground storage tank testing. This flyer includes UST fuel composite standards, single source fuel standards, fuel surrogate & internal standards, & standards blended for specific state methods. (PDF - 438kB)

Increase Polycyclic Aromatic Hydrocarbon Sample Throughput

Here we analyze polycyclic (polynuclear) aromatic hydrocarbons (PAHs) from the US EPA, European Union (EU), and Portugal lists by UHPLC and HPLC. Procedures shown use two optimized stationary phases (Pinnacle[®] DB PAH and Pinnacle[®] II PAH) and provide 3.5 to 6 minute analyses, allowing labs to achieve significantly faster sample throughput.

One Stop Shop for EPA Method 535

An optimized EPA Method 535 procedure offers superior sensitivity for the ethanesulfonic acid (ESA) and oxanilic acid (OA) degradates of chloroacetanilide herbicides alachlor, acetochlor, and metolachlor. Alachlor ESA and acetochlor ESA isomers are reliably resolved, and the procedure is simplified with a full line of Method 535 products, including reference standards, solid phase extraction cartridges, and HPLC columns.



Thermal Desorption: A Practical Applications Guide: I. Environmental Air Monitoring and Occupational Health & Safety

Thermal desorption is now recognized as the technique of choice for environmental air monitoring and occupational health and safety. This 28-page publication from Markes International Ltd. presents several real world thermal desorption applications. (PDF - 1137kB)

Enhancing Air Monitoring Methods with Thermal Desorption

The use of carbon disulfide (CS₂) extraction as an air monitoring method for vapor-phase organic compounds (VOCs) is fundamentally limited with respect to detection limits. Thermal desorption (TD) is a complementary gas extraction technique whereby sorbent tubes are heated in a flow of carrier gas. Trapped vapors desorb from the sample tubes into the gas stream and are transferred into the GC/MS analyzer. Here, we summarize the key advantages of thermal desorption versus solvent extraction.

13 Minute Chlorophenoxyacid Herbicides Analysis

The Rtx[®]-CLPesticides and Rtx[®]-CLPesticides2 column pair is an excellent choice for chlorophenoxyacid herbicide analysis. Now, with an optimized film thickness for the 0.32mm ID version, this difficult analysis can be made in less than 13 minutes on both the primary and confirmation columns. Near baseline resolution is achieved for all analytes except for bentazon/picloram on the Rtx[®]-CLPesticides column; however, this pair is fully resolved on the Rtx[®]-CLPesticides2.



Whole Air Sampling for Vapor Intrusion

This 2-page note describes the features and benefits of our popular TO-Can[®] air monitoring canisters (SUMMA[®] can equivalents), our new canister air sampling timer, and our convenient, reliable passive air sampling kits. (PDF - 206kB)



A Guide to Preparing and Analyzing Chlorinated Pesticides

Analyses of chlorinated pesticides can be difficult because samples often are contaminated with non-target compounds (e.g., lipids), and the method can require rigorous quality control. Our 24-page guide covers sample extraction methodology, sample cleanup, and chromatography. A chromatographic analysis of widely used chlorinated herbicides also is illustrated. One of our most popular technical guides. (PDF - 4049kB)

PAHs such as benzo(b)fluoranthene & benzo(k)fluoranthene, and indeno(1,2,3-cd)pyrene and dibenzo(a,h)anthracene. Both basic and acidic compounds show good response even at low levels.

Complete Resolution of 13 DNPH Carbonyls as Derivatives

The new Allure® AK HPLC column was developed specifically for the analysis of aldehydes and ketones, including the 13 carbonyl compounds specified in the California Air Resources Board (CARB) Method 1004. The data shown in this article demonstrate excellent resolution, even of butyraldehyde and methyl ethyl ketone (MEK), in less than 12 minutes using a 200mm Allure® AK HPLC column.

Resolving the Benzo(j)fluoranthene Challenge

Polynuclear aromatic hydrocarbons are a significant, and wide-spread, source of pollution. The US EPA mandates testing of the 16 PAHs they designate as most hazardous; the target list in other countries is expanding and includes new compounds that are difficult to separate. Here we demonstrate the ability of the Rxi®-17 column to effectively resolve dibenzo pyrene isomers, as well as to separate benzo(j)fluoranthene from benzo(b)fluoranthene and benzo(k)fluoranthene.

Faster Organochlorine Pesticide Sample Throughput

Increasing sample throughput is an effective way to reduce operating costs for environmental labs. Here we introduce new film thicknesses for the Rtx®-CLPesticide and Rtx®-CLPesticide2 GC columns, optimized for complete separations and short analysis times. Using these new columns, all US EPA Method 8081 organochlorine pesticides are resolved in <9 min. We also show complete separation of these compounds in <5 min. using these columns and a Gerstel MACH column heating system.

Choosing a Liner for Semivolatiles Analyses

Liner choice is a critical decision in semivolatiles analysis. Liners containing wool packing are recommended to minimize molecular weight discrimination. Attributes of different types of liners, including the Drilled Uniliner®, are discussed.



Reduce Acetonitrile Dependence by Analyzing Polycyclic Aromatic Hydrocarbons with Methanol-Based Mobile Phase

Switching to a methanol-based mobile phase for polycyclic aromatic hydrocarbon analysis—using the method shown here—is an effective way to save money by reducing acetonitrile consumption. (PDF - 119kB)

High Throughput of Semivolatile Samples by GC/MS

We developed the 20m x 0.18mm x 0.30µm Rxi®-5ms column to balance the demand for shorter analysis times with the need to maintain both column capacity and column efficiency. Here we establish conditions for eluting more than 90 semivolatiles, including 7 surrogates and 6 internal standards, in less than 12 minutes. Benzo(b) and benzo(k)fluoranthene were resolved well and sample throughput was improved by 75%. This highly inert, low bleed column is ideal for GC/MS analysis.



Thermal Desorption Tubes: Versatile Air Sampling for a Wide Range of Applications

This flyer give an overview of TD sampling and describes many applications that can be sampled using this versatile technique. Includes a comparison of tube and canister sampling, to help you determine which VOC sampling technique is best for you. (PDF - 177kB)

Fast, Sensitive LC/MS/MS Analysis of Paraquat and Diquat

Developed through collaboration with scientists at AB/MDS Sciex, this analysis allows complete resolution of paraquat and diquat with a simple, isocratic mobile phase. It is significantly faster than conventional methodologies and, with detection limits of 5ppb for paraquat or 0.1ppb for diquat, sensitivity is superior — without preconcentration.

Low-Level GC/MS for Semivolatiles in Drinking Water

Using this new column, resolution and peak shapes for 88 semivolatile compounds commonly analyzed in drinking water are exceptionally good at 10ng each on column. Because the Rxi®-5ms column performs well with analytes in a diverse range of chemical classes, we highly recommend it for analyzing complex mixtures of semivolatiles.

Analysis of Semivolatile Organics

Exceptional inertness and ultra-low bleed enable an Rxi®-5ms column to resolve sub-1ng quantities of acidic or basic analytes under a single set of conditions. In this example analysis, an Rxi®-5ms column separated 93 target analytes in US EPA Method 8270D in less than 18 minutes.

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inertness, ultra-low bleed, and batch-to-batch reproducibility as our Rxi[®]-5ms columns. Rxi[®]-1ms columns provide excellent selectivity and symmetric peaks for the diverse chemicals that can make up a semivolatiles sample.

Monitoring Petroleum Hydrocarbons by Solid Phase Extraction/GC

New manufacturing processes for our Massachusetts TPH solid phase extraction cartridges reduce extractable contaminants almost to blank levels, and assure more reliable fractionation of aliphatics from aromatics. Large, uniform lots of silica reduce the frequency of verifying fractionation results.

A 12-Minute Purge and Trap GC/MS Analysis for Volatiles

An Rtx[®]-VMS column provides rapid, baseline resolution of most volatile analytes in the CLP OLM 04.1 analysis for groundwaters or drinking waters from Superfund sites. A particularly challenging stipulation of the method, 90% resolution of the gaseous components, is easily attained.

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Clinical, Forensic & Toxicology

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Rapid and Accurate LC-MS/MS Analysis of Nicotine and Related Compounds in Urine Using Raptor™ Biphenyl LC Columns and MS-Friendly Mobile Phases

A rapid, accurate, and reproducible method was developed for high-throughput testing of nicotine, cotinine, *trans*-3'-hydroxycotinine, nor nicotine, norcotinine, and anabasine in urine. Data show that a fast and highly efficient analysis of these basic compounds can be achieved with the Raptor™ Biphenyl column using standard, low pH, reversed-phase LC-MS mobile phases which are compatible with a variety of LC-MS instrumentation.



RxSi®-5SiI MS Columns: Assured Performance for Forensic Applications

RxSi®-5SiI MS columns produce excellent results for a number of forensic applications. The versatile selectivity separates a wide variety of compounds, which lets you keep analyzing samples instead of changing columns between methods. (PDF - 1751kB)



Raptor™ Biphenyl LC Columns Brochure

Raptor™ LC columns combine the speed of superficially porous particles (i.e., SPP or "core-shell") with the resolution of highly selective USLC® technology. Featuring Restek's most popular LC stationary phase, the rugged Raptor™ Biphenyl is extremely useful for fast separations in bioanalytical testing applications like drug and metabolite analyses, especially those that require a mass spectrometer (MS). (PDF - 5848kB)



Dissecting Raptor™ LC Columns: A closer look at a new species

When we engineered our superficially porous particle (SPP or "core-shell") Raptor™ LC columns, we developed the bonding chemistries that are best suited to both the SPP construction and our highly selective USLC® phases. But we didn't stop here. Take a closer look at a new species as we dissect the upgraded hardware and new, proprietary packing techniques behind Raptor™ LC columns and Raptor™ EXP® guard columns. (PDF - 1987kB)

Fast, Robust LC-MS/MS Method for Quantification of Multiple Therapeutic Drug Classes Using an Ultra Biphenyl Column

Therapeutic drug monitoring requires streamlined, cost-effective testing procedures. This article details a fast, robust LC-MS/MS method for the quantification of 29 therapeutic drugs and metabolites in urine from several classes including opiates, benzodiazepines, tricyclic antidepressants, and anticonvulsants. Good linearity, accuracy, and precision results were obtained for most analytes in a fast, 5.5-minute analysis.



New Rtx®-BAC Plus 1 and Rtx®-BAC Plus 2 Columns: Advanced Technology for Fast, Reliable Measurement of Alcohol in Blood

New Rtx®-BAC Plus columns outperform other blood alcohol column pairs and ensure baseline separation of all critical compounds. These columns provide definitive data in a fast, 2-minute analysis, so you can be certain of your results and maximize sample throughput. (PDF - 940kB)



Fast, Definitive Data for Blood Alcohol Testing

New Rtx®-BAC Plus 1 and Rtx®-BAC Plus 2 columns provide definitive results quickly, so you can maximize sample throughput. These columns baseline separate all critical blood alcohol compounds, including ethanol, methanol, acetone, tert-butanol, acetaldehyde, isopropanol, and n-propanol, in less than 2 minutes. (PDF - 522kB)

USLC® Columns Put the Right Tools in Your LC Method Development Toolbox

Column selectivity has the most significant influence on chromatographic peak separation, or resolution, so choosing the right column can greatly speed up HPLC and UHPLC method development. In this



Restek Ultra Biphenyl Columns: Next Generation Phenyl Columns are the Best Choice for Pain Panel Analyses

The aromatic retention of Ultra Biphenyl columns for pharmaceutical and drug-like compounds makes them ideal for pain panel analyses, such as the AB SCIEX Cliquid® pain method, as well as clinical methods for NSAIDs, THC and metabolites, synthetic cannabinoids, steroids, hormones, and sulfonamides in milk. (PDF - 566kB)

4.5 Minute Analysis of Benzodiazepines in Urine and Whole Blood Using LC/MS/MS and an Ultra Biphenyl Column

Sample throughput for benzodiazepines in urine and whole blood can be increased by adopting this dilute-and-shoot LC/MS/MS method which uses an Ultra Biphenyl HPLC column. Partial validation data are presented in this application note.

LC/MS/MS Analysis of Metabolites of Synthetic Cannabinoids JWH-018 and JWH-073 in Urine

This application note details a fast extraction and analysis method for a wide range of metabolites of synthetic cannabinoids JWH-018 and JWH-073 in urine. Quantitative results are reported for carboxylated and mono-hydroxylated metabolites, including positional isomers.



Biphenyl: Leading Resolution in LC for Clinical and Forensic Applications

Versatile Biphenyl columns provide excellent retention of both polar and nonpolar compounds, resulting in improved resolution of benzodiazepines, cannabinoids, and other key target compounds for clinical or forensic applications. (PDF - 633kB)

Fast Screening of Recalled Tylenol® for Tribromoanisoole and Related Adulterants Using QuEChERS and GC-TOFMS

Screening methods for consumer product adulteration cases, such as the recent Tylenol recall, can benefit from fast QuEChERS-based sample preparation and sensitive, full mass-range GC/TOF-MS.

Sensitive GC/MS Analysis for Drugs of Abuse

An Rxi®-5ms column will resolve acidic/neutral or free basic drugs under one set of conditions. There is no interference from column bleed — not even at 330°C. This is one of the first published applications for our new family of Rxi® columns.

Reduce Downtime and Cost of Materials with Rugged Rxi®-5Sil MS GC Columns

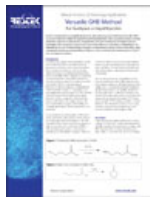
New Rxi®-5Sil MS columns produce consistent results for amphetamine—even after 400 injections of derivatizing reagent—resulting in less time and money spent on column maintenance and replacement.

5 Minute Analysis of Vitamin D in Serum by LC/MS/MS

Conventional techniques for vitamin D analysis often lack adequate sensitivity, specificity, and speed. This LC/MS/MS assay results in highly symmetric peaks that elute in just 5 minutes.

Fast Screening and Confirmation of Gamma-Hydroxybutyrate (GHB) in Urine

The headspace (HS) analysis of gamma-hydroxybutyrate (GHB) described here reduces contamination and eliminates time-consuming derivatization. Confirmation testing using an Rtx®-5MS column, provides definitive results in less than 7 minutes.



Versatile GHB Method For Headspace or Liquid Injection

The headspace (HS) analysis of gamma-hydroxybutyrate (GHB) described here reduces contamination and eliminates time-consuming derivatization. Confirmation testing using an Rtx®-5MS column, provides definitive results in less than 7 minutes. (PDF - 210kB)

Reliably Confirm Cannabinoids by GC-MS

Screening for evidence of marijuana use is typically done using an immunoassay method to detect derivatives in urine, but confirmation of positive results requires GC-MS. Here we describe a GC-MS method, using an Rxi®-5ms column, that resolves all major cannabinoid metabolites to baseline and exhibits very low bleed, even at 300 °C. We also prolonged column life by baking at 340 °C to remove derivatization by-products.

meets the requirements for low bleed and inertness better than any column we have tested. We analyzed a variety of derivatized steroid sex hormones in less than 25 minutes, with excellent resolution and symmetric peaks. At 300°C or above, bleed from the Rxi®-1ms column was negligible.

GC Inlet Liner Deactivations for Basic Drug Analysis

Basic drugs can interact with active sites on the surface of the inlet liner, reducing responses. The combination of a base-deactivated liner and a base-deactivated Rtx®-5Amine column ensures the greatest responses in analyses for these compounds.



Thermal Desorption: A Practical Applications Guide: III. Defence and Forensic

Thermal desorption is used extensively for forensic science. This 16-page publication from Markes International Ltd. presents several key applications including drugs, arson accelerants, trace explosives, shotgun propellant, and inks. (PDF - 665kB)



Fast, Accurate Analysis of Synthetic Cannabinoids and Metabolites in Human Urine by LC-MS/MS

Determination of cannabinoids and their metabolites is increasingly in demand at many forensic toxicology laboratories, but developing accurate, rugged LC-MS/MS methods is quite challenging. For example, synthetic cannabinoids JWH-018 and JWH-073 and their metabolites cannot be distinguished by MS/MS alone due to the presence of multiple positional isomers with identical molecular weights and very similar fragmentation patterns. These analytes must be chromatographically separated for accurate reporting. Using a Raptor™ Biphenyl LC column and simple dilute-and-shoot methodology, we separated these key cannabinoids and their metabolites in urine with analysis times of less than 7 minutes. (PDF - 837kB)

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Foods, Flavors & Fragrances

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Featured Application: Multiclass Veterinary Antibiotics on Raptor™ C18 by LC-MS/MS

One Analysis, One Column, Less than 9 Minutes for Over 60 Multiclass Antibiotics: The use of antibiotics on food-producing animals is a public health and safety concern due to the potential of generating drug-resistant bacteria. A sensitive, efficient, and reliable analytical method for different classes of antibiotics is necessary to meet regulations covering maximum residue limits (MRL) for a variety of animal tissue and food products. The Raptor™ C18 LC column is the ideal choice.

Analysis of Nicotine and Impurities in Electronic Cigarette Solutions and Vapor

Despite the growing popularity of electronic cigarettes, relatively little work has been done to characterize their vapor. In this study, we developed a quick, simple thermal desorption device for sampling vapor, as well as methods for analyzing vapor and solutions to determine nicotine content (GC-FID) and impurity profiles (GC-MS). This novel approach, which utilizes an Rtx®-VMS column, provides detectable levels of volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) from a single 40 mL puff.



Growing Analytical Solutions for Cannabis Testing

Restek has been helping cannabis labs establish innovative, cost-effective analytical solutions from the very beginning. We have the GC and LC products and expertise you need today for analyzing potency, terpenes, residual solvents, and pesticide residues. And we are developing the products you'll need tomorrow for emerging cannabis applications in this fast-growing industry. (PDF - 5367kB)

Analytical Method for Polycyclic Aromatic Hydrocarbons (PAHs) in Yerba Mate Tea Using Modified QuEChERS, Solid Phase Extraction and GC-TOFMS and GC-MS/MS

This application note describes the development of an analytical method for PAHs in tea that allows analysts to more quickly and accurately characterize target PAHs. Sample preparation is based on a modified QuEChERS extraction and solid phase extraction sample cleanup. Both GC-TOFMS and GC-MS/MS techniques were used and analyses were optimized for resolution of isobaric compounds, as well as for maintaining a reasonable analysis time.

High-Quality Analysis of Pesticides in Cannabis Using QuEChERS, Cartridge SPE Cleanup, and GCxGC-TOFMS

As medical marijuana is more frequently prescribed, patient safety must be ensured. Pesticide residue testing is an important part of assuring safe product is dispensed, but analysis can be extremely challenging due to matrix complexity. The use of QuEChERS, cartridge SPE cleanup, and GCxGC-TOFMS as presented here produces high-quality quantitative data for this difficult analysis.

Don't Overestimate Cannabidiol During Medical Cannabis Potency Testing by Gas Chromatography

Proper GC column choice is essential for accurate and robust medical cannabis potency testing. Using an Rxi®-35Sil MS column under the instrument conditions shown here allows fast, accurate reporting of cannabichromene and cannabidiol in medical marijuana samples.

A Fast, Simple FET Headspace GC-FID Technique for Determining Residual Solvents in Cannabis Concentrates

As the cannabis industry expands, demand is increasing for analysis of residual solvents in cannabis concentrates in order to protect consumer safety. This application note details a simple, fast, accurate test for common residual solvents using full evaporation technique headspace GC-FID and an Rxi®-624Sil MS column.

A Preliminary FET Headspace GC-FID Method for Comprehensive Terpene Profiling in Cannabis

This application note describes an FET-HS-GC-FID method that was developed in hops for the analysis of terpenes in cannabis. Good chromatographic separation allowed quantification of critical compounds across the volatility range, including α -pinene, β -myrcene, α -humulene, β -caryophyllene, and

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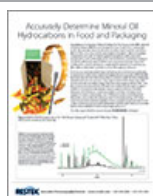
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Simplify and speed up sample preparation with Resprep® dSPE tubes! Here we show the extraction and clean-up of pesticide residues from olive oil samples—twice as fast as GPC, with only a fraction of the solvent required for conventional SPE.



Stabilwax®-MS Columns—Thermally Stable, High Polarity GC Columns for Flavor, Food, Fragrance, Industrial Chemical, and Solvent Analyses

Low-bleed Stabilwax®-MS columns produce excellent results for the analysis of trace levels of polar compounds by GC-MS. These columns are ideal for a wide range of polar analytes including FAMES, flavor compounds, essential oils, solvents, aromatics, acrolein/acrylonitrile, and oxygenated compounds. (PDF - 7014kB)



Accurately Determine Mineral Oil Hydrocarbons in Food and Packaging

Accurate testing for mineral oil hydrocarbons (MOHs) in food and packaging is imperative to the safety of our food supply. Turn to Restek for the certified reference materials (CRMs), HPLC columns, GC guard columns, and GC analytical columns you need for world-class analysis of mineral oil saturated hydrocarbons (MOSH) and mineral oil aromatic hydrocarbons (MOAH) via online LC/GC coupling. (PDF - 1193kB)



HPLC Analysis of Glucosinolates in Vegetable Extracts without Ion Pairing Using an Ultra Aqueous C18 Column

Glucosinolates with hydrophilic functional groups are very difficult to retain by conventional reversed phase HPLC, and when the functional groups in a sample are diverse, polarity can differ widely, complicating the problem. Until now, reversed phase HPLC with an ion pairing reagent has been the inconvenient, but necessary, approach to these analyses. This 2-page note describes a column and conditions for analyses of glucosinolates, without ion pairing. (PDF - 435kB)

Evaluation of Dispersive and Cartridge Solid Phase Extraction (SPE) Cleanups for Multiresidue Pesticides in QuEChERS Extracts of Finished Tobacco Using GCxGC-TOFMS

We compared the efficacy of dSPE and cSPE cleanup methods for multiresidue pesticide analysis of QuEChERS extracts of finished tobacco products using GCxGC-TOFMS. Cleanup with dSPE tubes containing 7.5 mg of GCB and 25 mg of PSA produced better results than other methods, with average recoveries of 92% and 91% for 500 ppb and 50 ppb fortifications respectively.

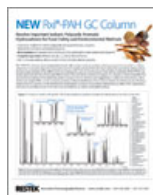
Mitigating Matrix Effects: Examination of Dilution, QuEChERS, and Calibration Strategies for LC-MS/MS Analysis of Pesticide Residues in Diverse Food Types

LC-MS/MS is popular for monitoring pesticide residues in food due to its selectivity and sensitivity; however, matrix effects can cause poor data quality and difficult quantification. We evaluated the relative effectiveness of sample dilution, QuEChERS cleanup, solvent-based calibration, and matrix-matched calibration strategies to mitigate matrix effects in celery, kale, avocado, lime, and brown rice flour.



Accurately Detect and Quantify 204 Pesticides of Global Concern by LC-MS/MS with Our New Certified Reference Materials Kit

Stop spending your time and money developing LC-MS/MS multiresidue pesticide methods and mixing reference standards when you could be running samples! Restek's trusted food safety experts have already done the work for you—with guaranteed accuracy and at a lower cost. (PDF - 3066kB)



New Rxi®-PAH GC Column; Resolve Important Isobaric Polycyclic Aromatic Hydrocarbons for Food Safety and Environmental Methods

Separate isobaric polycyclic aromatic hydrocarbons, including priority EFSA PAH4 compounds benz[a]anthracene, chrysene, benzo[b]fluoranthene, and benzo[a]pyrene, easily and accurately on an Rxi®-PAH column. Whether you need more resolution or faster analysis, these new GC columns offer the selectivity and efficiency you need for food safety and environmental PAH analysis. (PDF - 826kB)



Learn how to use the QuEChERS approach to perform faster, easier sample preparation and cleanup for multiresidue pesticide analysis. Q-sep™ QuEChERS products save time, money, and materials compared to modified Luke methods. (PDF - 2874kB)

A Comprehensive Approach to Pesticide Residue Testing, Including Non-Target Analysis, for Fruits, Vegetables, and Nuts, Using QuEChERS, LC-MS/MS, and GCxGC-TOFMS

Food commodities that varied in water, fat, and pigment content were fortified with pesticides and processed using a QuEChERS sample preparation technique. Samples were analyzed by both GCxGC-TOFMS and LC-MS/MS, and good recoveries were obtained for most pesticides in most commodities.

Increase Data Quality for Sulfonamide Residue Analysis by HPLC and UHPLC Using Unique Biphenyl Column Selectivity

The unique selectivity and high retention of Biphenyl columns produce complete separation of sulfonamide residues and benefit both UV and MS detection. In addition, Biphenyl columns in a UHPLC format allow faster sample throughput when testing for these antibiotics.

USLC® Columns Put the Right Tools in Your LC Method Development Toolbox

Column selectivity has the most significant influence on chromatographic peak separation, or resolution, so choosing the right column can greatly speed up HPLC and UHPLC method development. In this article, we discuss column choice and identify a set of just 4 stationary phases—Restek's USLC® column set—that encompasses the widest range of reversed phase selectivity available today.

Comparing Pesticide Residues in Amish and Commercially Grown Strawberries and Spinach Using QuEChERS, Various dSPE Sorbents, and GC-TOFMS

QuEChERS extraction, dSPE cleanup, and GC-TOFMS analysis were used to assess pesticide residue levels in strawberry and spinach from both commercial and Amish growers. Various dSPE sorbent products were compared to determine which were most effective.

Determining Pesticides in Dietary Supplements with QuEChERS Extraction, Cartridge SPE, and GCxGC-TOFMS

The novel approach used here combines QuEChERS extraction, cartridge SPE cleanup, and GCxGC-TOFMS analysis, resulting in good recoveries for a wide range of pesticides in dietary supplements. Matrices include dandelion root, sage, and a multi-herb finished product.



Q-sep™ New Product Supplement

QuEChERS solid phase extraction cartridges. SPE tubes, columns, and reference standards for fast, simple extraction, cleanup, and analysis of pesticide residue samples. Designed for AOAC and European methods. (PDF - 123kB)

Meet New Requirements for Melamine Analysis at 1µg/g in Infant Formula

The recent establishment of a 1µg/g safety threshold for melamine in infant foods has led to an immediate need for more sensitive methods. Here we established GC/MS conditions for highly reproducible analyses and evaluated the effectiveness of both solvent-based and matrix-matched standards. Using this method, melamine and cyanuric acid were reliably detected at and below 1µg/g in infant formula.

Comprehensive Pesticide Residue Analysis by LC-MS/MS Using an Ultra Aqueous C18 Column

Analysis of pesticide residues in foods is complicated by the large number of target compounds. LC-MS/MS analysis using an Aqueous C18 column provides more comprehensive results than GC alone.



Developing New Methods for Pesticides in Dietary Supplements

QuEChERS is a simple, effective approach to sample prep that can be applied to the analysis of pesticides in dietary supplements. Here we demonstrate a QuEChERS, cSPE, GC-TOFMS procedure that results in good recoveries for a wide range of pesticides in dandelion root. (PDF - 5523kB)



QuEChERS dSPE methods simplify extract cleanup, reduce material costs, and improve sample throughput. Here we demonstrate the effectiveness of QuEChERS sample cleanup using a multiresidue analysis of pesticides on strawberries. (PDF - 1180kB)

Using Thermal Desorption to Enhance Aroma Profiling by GC/MS

Thermal desorption offers an automatic, high-sensitivity alternative to conventional liquid extraction methods for aroma profiling by GC/MS. It allows vapor profile constituents to be cleanly separated from the sample matrix and often facilitates selective purging of volatile interferences. This ensures that the vapor profile analyzed is most representative of the aroma perceived by consumers and that key compounds can be identified and measured at the lowest levels possible.

Rapid Screening Method for Carbamates in Orange Oil

EPA Method 531.1 addresses the analysis of carbamate pesticides in water, but not in more complex matrices, which often contain interferences and require time-consuming sample preparation. We developed an easy, accurate screening method for carbamates in a complex matrix using an Ultra Carbamate HPLC column in conjunction with the Leco Unique TOF- MS. This method requires no sample preparation and provides fast analysis times, significantly increasing sample throughput.

High Sensitivity Melamine GC/MS Analysis of Cat Food

Melamine contamination was implicated in a large pet food recall that occurred in 2007 when animals died after eating contaminated pet food. Here, a modified GC/MS method, based on an FDA method, was used to analyze for melamine & related compounds cyanuric acid, ammeline, and ammelide in dry cat food. Analytes were easily identified by retention time matching and mass spectra.

Rapid Characterization of Garlic Volatiles—No Sample Prep Required!

Chromatographic methods for garlic and garlic powder are used by the food and dietary supplement industries to monitor product quality. Here we present a headspace gas chromatography mass spectrometry (HS GC/MS) method for garlic flavor and odor components using an Rxi®-5ms column. This method eliminates sample preparation making the bench work simple and fast. The experimental set-up is ideal for both screening analysis and low-level trace analysis.

Analysis of Nitrofurans in Honey

Nitrofurans are a class of veterinary antibiotics used to increase growth rate and prevent or treat disease in animals. Determining levels of nitrofurans in animal tissue, or even products such as honey, is important in studying drug resistance and allergies in humans. The Ultra C18 HPLC column is an excellent choice for LC-MS/MS analysis of nitrofurans at low levels in complex matrices such as honey. Here we show excellent sensitivity, resolution, and peak shape at trace levels.

Simple, Reliable HPLC Analyses of Organic Acids

Commonly used organic acid methods (e.g. AOAC method 986.13) depend on reversed phase HPLC and C18 columns, however these columns are vulnerable to phase collapse when used with the aqueous mobile phases necessary for optimal organic acid analysis. Restek's Ultra Aqueous C18, Allure® Aqueous C18, and Allure® Organic Acids columns all withstand phase collapse and resolve organic acids in a 100% aqueous mobile phase, compared to a conventional C18 column which shows a complete loss of retention.

Monitor Antioxidants in Tea Extract

An Ultra Aqueous C18 column enables you to use the conditions most effective for this analysis: gradient elution in high aqueous mobile phases. The C18 chains will not collapse in the presence of a high water content. Use this chromatographic system to extract data for specific compounds of interest and to manually inspect spectra for phenolic glycosides, esters of phenolic acid, or other compounds.

Fast, Simple Sample Cleanup

Quick, Easy, Cheap, Effective, Rugged, and Safe, the QuEChERS ("catchers") method for extracting pesticides from food is based on USDA research and employs a novel dispersive solid phase extraction cleanup (dSPE). QuEChERS methods are convenient, rugged methods that simplify extract cleanup, reduce material costs, and improve sample throughput. Here we demonstrate the effectiveness of QuEChERS sample cleanup using a multiresidue analysis of pesticides on strawberries.

Robust 9-Minute GC Analysis of Cholesterol

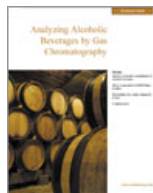
Conditions are established for analyzing both derivatized and underivatized cholesterol on a highly inert Rxi®-5ms column. Methods described include both an isothermal analysis for use when interferences are minimal, but sample throughput is critical, and a temperature program for use when separation of analytes from contaminants or interfering compounds is the primary concern. Results for both derivatized and underivatized samples were highly reproducible.

[trans Fat: Resolving cis and trans FAME Isomers by GC](#)

The highly polar Rt-2560 stationary phase has the selectivity needed for resolving cis and trans FAME isomers to comply with US FDA food labeling guidelines. Restek reference materials will help you accurately characterize your materials.

[Malachite Green and Leucomalachite Green Analysis](#)

Illegal use of malachite green (MG), an inexpensive fungicide, can allow MG to enter water cycles, where it is easily absorbed by fish tissue, and thus enters the human food supply. Reversed phase HPLC often is used to analyze for MG and its stored metabolite, leucomalachite green. Methods that facilitate detection of both compounds are discussed.



[Analyzing Alcoholic Beverages by Gas Chromatography](#)

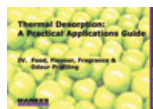
Volatile component profiles of alcoholic beverages reveal a wide range of compounds: acids, alcohols, aldehydes, and others. This 16-page guide describes packed column GC and capillary GC approaches to monitoring these complex mixtures of analytes. A separate section is devoted to detailed information about quantifying trace sulfur compounds in beer. (PDF - 360kB)

[Detecting Illegal Dyes in Foods](#)

Using an Ultra Aqueous C18 column, a simple, isocratic mobile phase, and detection at two UV wavelengths (488nm for Sudan I and II and 520nm for Sudan III and IV), the four dyes are separated and identified in approximately 20 minutes.

[Simple HPLC Analysis for Sudan Dyes](#)

Sudan dyes are illegal as food additives according to the US FDA and the EU. A reversed phase HPLC separation of Sudan I, Sudan II, Sudan III, and Sudan IV (Scarlet Red) is simple, yet efficient, requiring only a simple mobile phase, isocratic elution, and detection at two wavelengths. An Ultra Aqueous C18 column provides the selectivity needed to assure the separation.



[Thermal Desorption: A Practical Applications Guide: IV. Food, Flavour, Fragrance & Odour Profiling](#)

Thermal desorption is used extensively for measuring volatile and semivolatile components in foods, flavors, fragrances, and odors. This 28-page publication from Markes International Ltd. presents several key applications. (PDF - 1952kB)

Show entries

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Petroleum & Petrochemical

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Virtually Particle-Free Rt®-Silica BOND Columns Provide Reliable PLOT Column Performance With Less Time Lost for Maintenance

Get PLOT column performance and minimize maintenance by using Rt®-Silica BOND PLOT columns from Restek. These columns offer the retention and capacity needed for the analysis of light hydrocarbons, sulfur gases, halocarbons, and permanent gases, while providing nearly particle-free operation which results in less down time for maintenance and more stable retention times. Every column is QC tested with sensitive C4 probes to ensure consistent column-to-column selectivity.

ASTM Petrochemical Method Chromatography Product Guide

Restek is your ideal partner for integrated petrochemical solutions, and our ASTM method product guide will help you quickly pick the right GC columns and reference standards for SimDist, DHA, finished gasoline, and other common petroleum analyses.



NEW! Rt®-Silica BOND Columns

Rt®-Silica BOND PLOT columns from Restek are ideal for light hydrocarbon, permanent gas, and CFC analyses. We individually QC test every column with sensitive C4 probes to ensure consistent column-to-column selectivity. Our proprietary manufacturing process practically eliminates particle release, resulting in highly stable retention times. (PDF - 601kB)

Benefits and Considerations of Converting to Hydrogen Carrier Gas

The current helium shortage has severely impacted gas chromatographers who are finding that helium has become significantly more expensive and is not always available when needed. This article explores the benefits and considerations of replacing helium with hydrogen carrier gas.



MXT®-1HT SimDist Columns (5 m x 0.53 mm x 0.10 µm) are Individually Application Tested up to 430 °C for Guaranteed Method Performance!

Only MXT®-1HT SimDist columns (5 m x 0.53 mm x 0.10 µm, cat.# 70112) are individually tested against ASTM Method 6352 specifications, guaranteeing they will meet performance requirements! (PDF - 949kB)

Fingerprinting Crude Oils and Tarballs using Biomarkers and Comprehensive Two-Dimensional Gas Chromatography

Comprehensive two-dimensional gas chromatography time-of-flight mass spectrometry (GCxGC-TOFMS) was used to analyze petroleum biomarkers creating unique fingerprints of crude oil samples and tarballs collected after the Deepwater Horizon oil spill.

Using Micropacked GC Columns for Analyzing Volatiles in Light Hydrocarbon Streams

Most analysts still use traditional packed columns for light hydrocarbon analysis, but many adsorbents are also available in micropacked column formats. Micropacked columns are a good alternative when both efficiency and sample loadability are desired.

Advanced Capillary Column Technology Improves Analysis of Volatile Amines

Volatile amines, such as monomethylamine, diethylamine, and triethylamine, are widely used in the petrochemical industry, but are prone to poor peak shape and difficult to analyze. Low levels of volatile amines can now be accurately reported using new Rtx®-Volatile Amine columns due high column inertness.

Analyze ppb Level Sulfur Compounds Using an Rt®-XLSulfur Micropacked GC Column or an Rtx®-1 Thick Film Capillary GC Column

Trace levels of sulfur compounds are separated and quantified by using an Rtx®-1 capillary column or

Rt[®]-XLSulfur Packed GC Column for Analysis of Low-Level Sulfur Compounds in C1-C6 Hydrocarbon Streams

Rt[®]-XLSulfur columns resolve hydrocarbons from sulfur compounds in hydrocarbon process streams and exhibit excellent inertness with low ppbv levels of sulfurs.



Restek's PLOT Column Family — The Benchmark For Performance!

Restek's PLOT column family is the benchmark for performance! Our innovative bonding process minimizes particle release, reducing column blockage and protecting instrument parts. More consistent flow means stable retention times in Deans and related flow switching techniques. And outstanding peak symmetry improves impurity analysis for gases, solvents, and hydrocarbons. (PDF - 2013kB)



Rt[®]-XLSulfur Packed Column: Specialized packed and micropacked columns for eXtra-Low Sulfur analysis

Rt[®]-XLSulfur packed and micropacked columns combine a unique, efficient porous polymer packing material and true inertness toward active analytes, to ensure excellent and reliable results in trace-level analyses of hydrogen sulfide, sulfur dioxide, and other lightweight sulfur compounds. (PDF - 433kB)



Detailed Hydrocarbon Analysis Featuring Rtx[®]-DHA Columns

Superior performance for DHA analysis! Rtx[®]-DHA columns offer 50% faster run times when used with hydrogen, improved resolution between oxygenates and hydrocarbons, and guaranteed column-to-column reproducibility. These columns also meet or exceed all ASTM and CAN/CSGS method guidelines. (PDF - 3922kB)

Improve Trace Analysis of Acetylene, Propadiene, and Methyl Acetylene Impurities With Higher Sample Capacity Alumina MAPD Columns

Rt[®]-Alumina BOND/MAPD columns offer higher capacity than other MAPD columns and are ideal for analyzing acetylene, propadiene, and methyl acetylene in petroleum gases. Greater capacity improves data accuracy due to better peak symmetry and a wide linear range.



Resolve Benzene and Toluene in Spark Ignition Fuels Containing Ethanol

This 2-column set for modified ASTM Method D3606-10 completely resolves benzene from ethanol in reformulated fuels containing ethanol. The aromatic compounds also are fully separated and can easily be quantified using sec-butanol as an internal standard. (PDF - 1852kB)

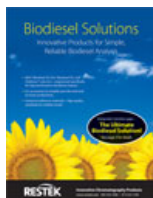
Analysis of Trace Hydrocarbon Impurities in 1,3-Butadiene Using Optimized Rt[®]-Alumina BOND/MAPD PLOT Columns

Impurity analysis of 1,3-butadiene on an Rt[®]-Alumina BOND/MAPD column results in good separation of both light polar impurities (methyl acetylene, propadiene) and 4-vinylcyclohexene, a heavier contaminant that often requires testing on a second column.



ShinCarbon ST Micropacked GC Columns: Above-Ambient Analyses of Permanent Gases and Light Hydrocarbons

A ShinCarbon ST micropacked column will separate hydrogen, oxygen, nitrogen, carbon dioxide, carbon monoxide, and methane in 10 minutes, without cryogenic cooling. This 2-page note also shows separations of light hydrocarbon/permanent gas mixtures, natural gas components, and fluorocarbons. (PDF - 342kB)



Biodiesel Solutions: Innovative Products for Simple, Reliable Biodiesel Analysis

This flyer includes data demonstrating the performance of recommended GC columns for the analysis of total glycerin, fatty acid methyl esters (FAMES), and residual methanol in biodiesel. Features a comparison of metal and fused silica columns. (PDF - 1652kB)



Rt®- and MXT®-Alumina BOND/MAPD PLOT columns outperform other MAPD columns for trace analysis of methyl acetylene, acetylene, propadiene, and other polar hydrocarbons. The new deactivation results in more predictable responses, increased capacity, and higher temperature stability. (PDF - 827kB)

GCxGC Analysis of Complex Petroleum Hydrocarbons: Sulfur Speciation in Diesel

Comprehensive 2D GC, also known as GCxGC, is a powerful technique with a great deal of potential for improving separations of complex petroleum and petrochemical samples that contain hundreds—or even thousands—of components. While GCxGC is still considered emerging technology and is used primarily in research and development labs, it has undergone significant growth in the past few years.

New Alumina Column Shows Promise for Analyzing Chlorofluorocarbons

Rt®-Alumina BOND/CFC columns provide high retention and high selectivity for volatile halogenated hydrocarbons, without the activity that is usually observed with alumina adsorbents. Chlorofluorocarbon analysis, in particular, can benefit from this new technology.

Extending the Power of Stabilized PLOT Column Technology to Process GC Analyzers

New metal MXT® PLOT columns offer greater stability than conventional PLOT columns, making them a better choice for process GC analyzer applications. New bonding techniques result in highly reproducible flow characteristics, improved layer stability, and excellent separation efficiencies.



Solutions for Your Petro Analyses

Chromatograms, technical tips, and products developed specifically for petrochemical testing. Details recommendations for simulated distillation, PLOT column applications, DHA, D3606, biodiesel, permanent gases and hydrocarbons. (PDF - 3265kB)



Solutions for Gas Sampling

Ensure sample integrity with robust, reliable gas sampling products from Restek. This 4-page note details the benefits Sulfinert® passivation treatment and provides product information for sample cylinders, high pressure sample cylinders, valves, and more. (PDF - 1898kB)

Protect Natural Gas Sample Integrity and Prevent Sulfur Loss with Sulfinert® Sample Cylinders

Sulfur compounds in fuel streams can damage equipment and reduce BTU values. Sulfinert® sample cylinders are significantly more inert than stainless steel cylinders and assure sample integrity during collection, transportation, and storage.

Faster DHA Analyses Using Helium or Hydrogen

Rtx®-DHA columns are highly stable and can be run with helium or hydrogen under accelerated conditions. Restek has developed a new DHA method using Rtx®-DHA columns with hydrogen that can double refinery sample throughput.

Tighten Control of Distillation Processes with the New MXT®-1HT Sim Dist Column

New MXT®-1HT SimDist GC columns outperform competitors, allowing more productive D6352 analyses. Here we demonstrate lower bleed levels and higher efficiency, improving resolution and assuring more samples can be run within method specifications.



17 Minute D2712 Analysis of Impurities in Propylene Using PLOT Columns

When analyzing hydrocarbon impurities in propylene by ASTM D2712, using an Rt®-Alumina BOND Na2SO4 PLOT column instead of a packed column setup provides the greatest degree of resolution in the least amount of time. (PDF - 121kB)

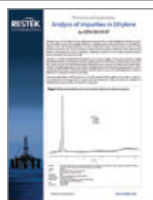
Eliminate Column Breakage in High Temperature Biodiesel Analysis



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Stable Sulfur & Mercury Sampling in Refineries

Refinery and natural gas samples often contain trace amounts of sulfur- and mercury-containing compounds, which can interfere with reactions, poison catalysts in petrochemical processes, and damage equipment. Because these compounds quickly react with stainless steel surfaces, accurate determination of these compounds is impossible when samples are collected and stored in untreated sample cylinders. Restek's Siltek® and Sulfinert® passivation techniques bond an inert layer into the surface of stainless steel, preventing active compounds from reacting with or adsorbing to the steel.



Analysis of Impurities in Ethylene by ASTM D6159-97

When testing for impurities in ethylene using ASTM D6159-97, the combination of an Rt®-Alumina BOND column coupled to an Rtx®-1 column provides the best resolution of the most common hydrocarbon contaminants. (PDF - 175kB)

High Temp. Stability Problem Solved with New Metal Columns

The high temperatures required for biodiesel analysis by gas chromatography present a considerable challenge to analytical columns. Fused silica columns, even those rated for high-temperature tolerance, breakdown relatively quickly. Restek's new MXT®-Biodiesel columns are more stable up to 430°C and offer excellent chromatography for glycerides. These columns are available in two configurations: factory-coupled to a 0.53mm retention gap, or with a built-in, leak-proof Integra-Gap™ retention gap.

Fast, Accurate FAMES Analyses of Biodiesel Fuel

As biodiesel fuel continues to stimulate interest worldwide as an energy source, several gas chromatographic methods have been developed to determine the quality of B100 fuel. Here we show excellent peak symmetry, resolution, and reproducibility for determining the fatty acid methyl ester (FAME) and linolenic acid methyl ester content in B100 biodiesel fuel, using European standard method EN 14103 on a Stabilwax® fused silica GC column.

Biodiesel Analysis by European Methodology

Glycerin is a notoriously difficult challenge in GC, particularly at the levels involved in biodiesel oil analysis, but an Rtx®-Biodiesel column provides a symmetric peak that makes quantification easier and more reliable. The column performs well at elevated temperatures: peaks for glycerin and glycerides exhibit minimal tailing, and bleed is low at 370°C, as specified in European method DIN EN14105.

Separate Argon from Oxygen Above Ambient Temperatures

A Restek PLOT column can be your best solution for difficult separations of gaseous analytes. Rt-Msieve™ 5A PLOT columns offer fast, efficient separation of argon/oxygen, hydrogen/helium, and other permanent gases, including permanent gases in refinery or natural gas. You can make difficult separations without subambient temperatures, e.g.: separate oxygen from argon to baseline in approximately 4 minutes.

Analyze Biodiesel Oil for Glycerin

We challenged our Rtx®-Biodiesel column with analysis for glycerin in biodiesel according to method ASTM D-6584-00. Excellent linearity was established for glycerin, triolein, monolein, and diolein, with r^2 values exceeding the method criteria for all compounds. Mono-, di-, and triglycerides resolved well from other compounds in B100 biodiesel oil. Column performance was strong at high temperatures, with low bleed even at 380°C. An Alumaseal™ connector and guard column were used to extend column life.

How Good is Your PONA Column?

We evaluated our 100 meter x 0.25mm ID x 0.5df PONA column and equivalent columns from four other vendors, following ASTM D-6730 methodology (hydrogen carrier gas). Data and chromatograms presented here show that only the Restek PONA column performed to method specifications admirably. Column efficiency exceeded specification.

Sulfinert®-Treated Sample Cylinders

Recovery of a 17ppbv test standard of hydrogen sulfide exceeded 85% after 54 hours in a Sulfinert®-treated cylinder; recoveries of methyl mercaptan, ethyl mercaptan, carbonyl sulfide, and dimethyl disulfide exceeded 90%. A Sulfinert®-treated sampling/transfer system can assure accurate sulfur content data for natural gas, beverage-grade carbon dioxide, or other samples.

GC Analysis of Total Reduced Sulfurs at ppbv Levels

Ultra-low bleed and exceptional inertness assure complete separation of sulfur compounds (hydrogen sulfide, carbonyl sulfide, dimethyl sulfide, mercaptans) on our new column, with excellent peak shapes and reliable quantification at ppbv levels. A Sulfinert® treated sampling/transfer system assures no adsorption losses of these very reactive compounds.

Parker PFM Hydrogen Generators

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Importers & Manufacturers
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Analyze Hydrocarbons on OPN/Res-Sil™ C Bonded GC Packing

In process GC analyses, this material offers unique selectivity for the difficult-to-separate saturated and unsaturated C4 hydrocarbons, eluting *cis*-2-butene before 1,3-butadiene. Innovative bonding chemistry assures batch-to-batch reproducibility, excellent thermal stability, and long column life.



MXT®-1HT Sim Dist

ASTM Method D-6352, a simulated distillation of petroleum distillates, requires a capillary column compatible with oven temperatures to 430°C. At temperatures above 380°C, polyimide-coated fused silica becomes brittle, and column lives are very short. MXT®-1 HT Sim Dist columns combine the inertness of fused silica and durability of stainless steel, to meet all criteria in the method. Data for a series of 400 injections at 430°C affirm the low-bleed, long-lifetime characteristics of this column. (PDF - 97kB)



Molecular Sieve 5A and 13X: Packed GC Columns for Permanent Gas Separations

Restek has optimized molecular sieve 5A and 13X columns for trace analyses, including difficult analytes like oxygen and carbon monoxide. Example chromatograms in this 2-page note show sharp, symmetric peaks for permanent gases. (PDF - 88kB)

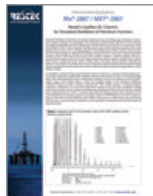
Res-Sil™ C Bonded GC Packings for Analyses of Light Hydrocarbons

n-Octane on Res-Sil™ C packing provides excellent, reproducible separations of volatile hydrocarbons in petroleum products, including the difficult-to-separate saturated and unsaturated C4 compounds. An OPN on Res-Sil™ C column separates C1-C5 hydrocarbons in half the time required by alternative columns.



GC Analysis of Petroleum Products

MXT®-1 Sim Dist and MXT®-500 Sim Dist columns combine the inertness of fused silica with the durability of stainless steel, meeting all ASTM Method D6352 (petroleum simulated distillation) criteria. MXT®-500 Sim Dist columns have lower bleed and longer lifetimes, but calculated boiling points for aromatics are higher (closer to true values); MXT®-1 Sim Dist columns offer polarity that matches published data. Includes chromatograms. (PDF - 111kB)



Rtx®-2887 / MXT®-2887: Restek's Capillary GC Columns for Simulated Distillation of Petroleum Fractions

ASTM D2887-01a is used to monitor petroleum products, excluding gasoline, with final boiling points of less than 538°C. Metal MXT®-2887 columns and fused silica Rtx®-2887 columns offer lower bleed, faster analysis times, and longer column lifetimes. (PDF - 76kB)



Rtx®-1 SimDist 2887: A Bonded Packed Column for Simulated Distillation

The stationary phase in Rtx®-1 Sim Dist columns is bonded to a highly deactivated silica support, ensuring inertness, stability, and column lifetime characteristics superior to conventional packed columns for Sim Dist analysis (ASTM Methods D2887, D3710). (PDF - 136kB)



Analyzing Oxygenates in Gasoline Using TCEP and Rtx®-1/MXT®-1 Columns

Two methods are used to quantify individual alcohols and ethers in gasoline: a single column OFID method (e.g., ASTM Method D5599-94) and dual-column ASTM Method D4815-93. Restek offers columns, calibration mixtures, and inert capillary tubing for both approaches. 4-page note. (PDF - 76kB)

New D3606 Column Set Outperforms TCEP Columns for Benzene Analysis

Restek's new D3606 column set outperforms TCEP columns for gasoline testing. The D3606 set has higher thermal stability and reliably resolves benzene from ethanol, resulting in more accurate quantitation.

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High-Quality Analysis of Pesticides in Cannabis Using QuEChERS, Cartridge SPE Cleanup, and GCxGC-TOFMS

As medical marijuana is more frequently prescribed, patient safety must be ensured. Pesticide residue testing is an important part of assuring safe product is dispensed, but analysis can be extremely challenging due to matrix complexity. The use of QuEChERS, cartridge SPE cleanup, and GCxGC-TOFMS as presented here produces high-quality quantitative data for this difficult analysis.

Don't Overestimate Cannabidiol During Medical Cannabis Potency Testing by Gas Chromatography

Proper GC column choice is essential for accurate and robust medical cannabis potency testing. Using an Rxi®-35Sil MS column under the instrument conditions shown here allows fast, accurate reporting of cannabichromene and cannabidiol in medical marijuana samples.



Raptor™ Biphenyl LC Columns Brochure

Raptor™ LC columns combine the speed of superficially porous particles (i.e., SPP or "core-shell") with the resolution of highly selective USLC® technology. Featuring Restek's most popular LC stationary phase, the rugged Raptor™ Biphenyl is extremely useful for fast separations in bioanalytical testing applications like drug and metabolite analyses, especially those that require a mass spectrometer (MS). (PDF - 5848kB)

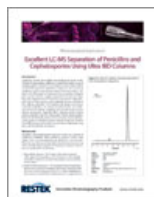


Dissecting Raptor™ LC Columns: A closer look at a new species

When we engineered our superficially porous particle (SPP or "core-shell") Raptor™ LC columns, we developed the bonding chemistries that are best suited to both the SPP construction and our highly selective USLC® phases. But we didn't stop here. Take a closer look at a new species as we dissect the upgraded hardware and new, proprietary packing techniques behind Raptor™ LC columns and Raptor™ EXP® guard columns. (PDF - 1987kB)

Characterizing Cellular Fatty Acid Methyl Ester (FAME) Profiles to Identify Bacteria Using Gas Chromatography

Dr. Radomír Čabala, Head of the Toxicology Department at the General University Hospital in Prague, presents work on the potential utility of GC-TOFMS analysis of cellular fatty acid methyl esters (FAMES) in identifying clinically relevant bacteria.



Excellent LC-MS Separation of Penicillins and Cephalosporins Using Ultra IBD Columns

Unlike C18 columns, Ultra IBD (intrinsically base deactivated) columns can interact in normal phase mode with analytes that possess charged functional groups, providing greater versatility for LC-MS analyses. Excellent peak shape in either normal phase mode or reversed phase mode increases sensitivity and improves quantification. The 4-page note shows example analyses of penicillins and cephalosporins. (PDF - 987kB)



Rxi®-624Sil MS Columns—Exceptionally Inert, Low Bleed Columns for Volatiles Analysis

Analyze volatile compounds and polar analytes with greater confidence using Rxi®-624Sil MS columns. Optimized selectivity, higher inertness, and lower bleed result in reliable separations and accurate, trace-level determinations. Includes environmental and pharmaceutical applications. (PDF - 3111kB)



USLC™ Column Selection & Mobile Phase Adjustment Guide

USLC™ columns and this guide will help you easily choose the right stationary phase to target nearly any analyte in reversed phase or HILIC method development. It will also help you adjust your mobile phase to further improve results without guesswork or wasted time. (PDF - 1682kB)

USLC™ Columns: The Right Tools in Your LC Method Development Toolbox

Column selectivity has the most significant influence on chromatographic peak separation, or resolution, so choosing the right column can greatly speed up HPLC and UHPLC method development. In this article, we discuss column choice and identify a set of just 4 stationary phases—Restek's USLC® column set—that encompasses the widest range of reversed phase selectivity available today.



How Column Inertness Improves the Chromatography of Basic Compounds

Not all column deactivations are appropriate for analyzing basic compounds. Here we demonstrate the effect of column inertness on peak shape, and discuss its role in improving method accuracy, sensitivity, and development time. (PDF - 227kB)

Fast Screening of Recalled Tylenol® for Tribromoanisole and Related Adulterants Using QuEChERS and GC-TOFMS

Screening methods for consumer product adulteration cases, such as the recent Tylenol recall, can benefit from fast QuEChERS-based sample preparation and sensitive, full mass-range GC/TOF-MS.

Determining Pesticides in Dietary Supplements with QuEChERS Extraction, Cartridge SPE, and GCxGC-TOFMS

The novel approach used here combines QuEChERS extraction, cartridge SPE cleanup, and GCxGC-TOFMS analysis, resulting in good recoveries for a wide range of pesticides in dietary supplements. Matrices include dandelion root, sage, and a multi-herb finished product.



USLC™ Columns: Choose Columns Fast. Develop Methods Faster.

Restek USLC™ columns offer the widest range of selectivity available and are an integral part of successful method development. Ideal for column switching systems, these columns provide orthogonal separations to create optimal resolution and robust methods—all in a 4-column set. (PDF - 1813kB)

Column Choice: A Critical Factor for Successful UHPLC Integration

Column choice is a critical factor in successfully transferring methods between UHPLC and HPLC. Here, we discuss the column qualities that contribute to the successful integration of UHPLC technology.

Novel Column Chemistry—High Impact, Low Cost Technology

Novel column chemistries are a simple change in an already budgeted consumable that can lead to optimized and more reliable methods—giving a fast return on a minimal investment.

Beyond C18—Increase Retention of Hydrophilic Compounds Using Biphenyl Columns

The Pinnacle® DB Biphenyl column offers enhanced retention and alternate selectivity for aromatic, unsaturated, and sulfur-containing hydrophilic compounds. Here we demonstrate significantly greater retention of sulfone- and sulfoxide-containing drug probes, compared to phenyl, phenyl hexyl, and alkyl (C18) columns. Only the Biphenyl column, using pi-pi interactions, separated both test probes to $k' > 2$, the level needed to ensure separation from unretained matrix contaminants.

Two Options for Analyzing Potential Genotoxic Impurities in Active Pharmaceutical Ingredients

Two options for the analysis of PGIs in API have been developed by Merck and Restek to meet different laboratory needs. The first option is a fast method for the analysis of sulfonate esters on the Rxi®-5Sil MS column. The second option is a comprehensive method for the analysis of both sulfonate esters and alkyl halides on the Rtx®-200 column. Both methods require very little sample preparation, which helps increase laboratory productivity.

How do intrinsically base-deactivated phases work?

Analyzing basic compounds can be somewhat troublesome on traditional alkyl stationary phases, namely conventional C18 columns. This is largely due to the interaction of analyte molecules with silanol groups present on the silica surface. To better understand the workings of silanol interactions, it is important to consider the composition of the support material. Silica is the most commonly used support in the production of HPLC columns, mainly because it is well-suited to high-pressure chromatographic separations, giving high efficiencies and good reproducibility. Silica offers bed and pressure stability and is highly porous, which ultimately gives rise to its large surface area, increased bonding capacity and high peak efficiencies. Silica also possesses widely-studied and effective bonding chemistries, making possible diverse analyte selectivities through a wide variety of bonded stationary phases.

... faster analysis times. Scaling conventional HPLC methods down to UHPLC can be an effective way to take advantage of shorter run times and increase sample throughput. Here we review the factors that must be considered when scaling down an existing method. A sulfonamides method transfer is used as an example; chromatograms and formulas for all required calculations are included.

Optimize Selectivity & Efficiency in UHPLC Separations

Ultra-high pressure liquid chromatography (UHPLC) can significantly increase efficiency and produce faster separations. The small particle sizes used in UHPLC improve efficiency; however selectivity is still the most important factor affecting compound resolution. Here we demonstrate the importance of stationary phase choice in UHPLC separations. By optimizing selectivity for your analytes of interest, faster separations can be achieved without compromising resolution.

Revised USP 467 Residual Solvent Method

The United States Pharmacopeia recently revised the general chapter on residual solvent analysis, USP <467>, to mirror the International Conference on Harmonization (ICH) guidelines for the identification, control and quantification of residual solvents. This revision, effective July 1, 2007, replaces previous methods that were not consistent with the ICH guidelines. Here we provide an overview, chromatograms, and technical tips for successfully running the new procedure.



Developing New Methods for Pesticides in Dietary Supplements

QuEChERS is a simple, effective approach to sample prep that can be applied to the analysis of pesticides in dietary supplements. Here we demonstrate a QuEChERS, cSPE, GC-TOFMS procedure that results in good recoveries for a wide range of pesticides in dandelion root. (PDF - 5523kB)



Residual Solvent Analysis: Implementing USP <467>

This 12-page reference includes a review of headspace fundamentals, the revised USP <467> method (July, 2008), chromatography for Procedures A, B, and C, and technical tips for optimization. Guidance on fast, effect method development is given. (PDF - 471kB)

How do small particle size columns increase sample throughput?

Why do smaller particle size columns improve resolution?

Explaining the Small Particle Advantage

Small particle HPLC columns can offer faster analysis times but only if the particle size distribution is tightly controlled. Restek's 1.9µm Pinnacle™ DB columns have tight, symmetric particle size distributions and contain no particles less than 1µm. Here we demonstrate how our stringent quality requirements translate into faster, more reproducible results compared to competitor columns. Greater column efficiency and reproducibility mean faster throughput and more consistent results.

Organic Volatile Impurities: Retention Time Index

To make column selection for residual solvents easy, Restek has benchmarked the ICH Class 1, 2 and 3 residual solvents on our most popular OVI columns.

Separating NSAIDs through Aromatic Selectivity

Non-steroidal anti-inflammatory drugs (NSAIDs) are typically separated on C18 phases. Separations on our Allure® Biphenyl HPLC column are based on pi-pi interactions, resulting in optimized retention and selectivity. Increased retention requires higher organic content in the mobile phase, increasing desolvation efficiency in LC/MS. Simple mobile phase changes enhance selectivity, making this column a great alternative to conventional phenyl phase columns, especially in method development.

Optimized RP-HPLC Method for Hydroxybenzoic Acids

Among hydroxybenzoic acids, hydroxyl groups on the benzene ring vary by position and number, creating differences in overall polarity and solubility. The unique bonding chemistry of the Ultra Aqueous C18 phase assures high resolving power, the best separations across a broad range of analyte polarity, and compatibility with 100% aqueous mobile phases.

Assaying Local Anesthetics by GC/FID

An Rxi®-5ms column and a wool-packed inlet liner provide the stability and inertness needed for these basic, active analytes. Chromatography from a six-replicate system suitability analysis was well within normal acceptance criteria. USP tailing factors were approximately 1.00 for all analytes; retention times and area responses were very stable.

pharmaceutical products, but no temperature program provides sufficient resolution on both columns. Using a Restek G43/G16 column pair and independent temperature programs in a Gerstel MACH column heating system, we analyzed and confirmed 23 Class 2 solvents in 8 minutes.

RP-HPLC Analysis of Selective Serotonin Reuptake Inhibitors

Two Restek columns provide good retention, selectivity, and peak shape for SSRIs, without ion-pairing chromatography. Choose an Allure™ Basix column and neutral pH conditions, or an Ultra PFP column and acidic conditions — either will improve performance for these basic compounds, relative to alkyl phases.

Using π - π Interactions to Enhance Selectivity for Unsaturated Compounds

Relative to phases that separate via hydrophobic or polar interactions, the Allure™ Biphenyl stationary phase offers better retention, selectivity, and efficiency, when analyzing compounds with differences in the numbers and locations of unsaturated bonds in the hydrocarbon ring structure.

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