TLC Catalog

TLC · Sorbents · Silica Gel · Anhydrous Solvents

EMD

Introduction to TLC catalog – by Fredric Rabel, Ph.D.

TLC in A World of Chromatography ...

Chromatography is the most widely used analytical technique in the sciences today. It has become an indispensable tool in research, quality control and production. This is particularly true in pharmaceutical, food & beverage, chemistry, and life science arenas. Thin Layer Chromatography (TLC) is just one of a wide range of liquid chromatography techniques used that includes: Liquid Column Chromatography, Solid Phase Extraction (miniaturized version of liquid column chromatography), and High Performance Liquid Chromatography (HPLC). All these techniques utilize the same principle; which states that the speed and efficiency of any separation is controlled by the particle size of the adsorbent and/or the size and configuration of the column or plate.

In the Beginning, there was Merck KGaA ...

In the mid-1950's Merck KGaA, Darmstadt, Germany, was the first company to supply bulk irregular silica for TLC (according to Stahl), and prepared TLC and HPTLC plates (High Performance TLC) on glass, aluminum and plastic supports. These offerings were followed by advances in thin layer technology, resulting in LiChrospher® (a spherical silica) and Chromolith® (a monolithic silica) TLC Plates which were added to the product line. More recently, Lux TLC plates (which contain a brighter fluorescent indicator for improved detection limits) were made available.

1906

M. Tswett invented chromatography as it is practiced today by causing differential migration of a mixture of chloroplast pigments from a narrow initial zone through a stationary phase in a column by development with a mobile phase. Tswett did not study TLC.

1938

N.A. Izmailov and M.S. Schraiber, at the Pharmaceutical Institute in Kharkov (Ukraine), analyzed plant tinctures by placing a drop of sample solution on a horizontal 2 mm layer of aluminum oxide without binder on a glass microscope slide. Methanol mobile phase was added dropwise to produce concentric circles of separated zones that were detected by absorption of ultraviolet (UV) light from a lamp. This was the first use of thin layer chromatogram development with mobile phase. It was called "spread layer chromatography" or "spot chromatography."

1949

J.E. Meinhard and N.F. Hall, at the University of Wisconsin, were the first to use binder to prepare layers. They bound a mixture of aluminum oxide and Celite with starch to microscope slides.

1951–1957

J.G. Kirchner and associates, working initially at the USDA laboratories in Pasadena, CA, and then the Coca Cola Company, published methods for TLC on narrow glass "chromatostrips" coated with silicic acid. This is essentially the same technique practiced today.

The Beauty and Simplicity of TLC ...

Thin Layer Chromatography is perhaps the most under-utilized of all of the chromatography techniques. Although it is plain and simple with no flashing lights or shiny buttons to push, it is surely an economical and efficient technology. There are no large capital investments needed to begin a TLC analysis and most procedures are fairly easy to set up and follow.

Many scientists in Organic and Medicinal Chemistry typically use TLC plates to monitor the progress of organic syntheses. At various points in the process, a sample will be removed to monitor the progress of the synthesis. Alternately, TLC may be used by researchers who are primarily interested in the separation of components. TLC is such a powerful technique that almost any mixture can be separated into its individual components and visualized.

TLC can be used to identify or characterize a wide variety of samples and can even be used for preliminary evaluations of samples destined for HPLC analysis. This catalog contains a synopsis of the history of TLC, as well as additional helpful hints that users will find extremely beneficial.

EMD Chemicals is Merck KGaA in North America ...

Always on the forefront of classical and new liquid chromatographic techniques, Merck KGaA, Darmstadt, Germany, continues to produce a full range of silicas and bonded silicas in bulk, columns and on thin layer plates. Contained within this catalog are the highly respected and well trusted products offered by EMD Chemicals.

1954

R.H. Reitsma, like Kirchner, also used larger glass plates for running several samples side-by-side or 2D TLC and coined the term “chromatoplate”.

1956

E. Stahl published his first paper on Dünnschichtchromatogaphie (TLC) and was the first to use the name “thin layer chromatography.”

1958

Merck KGaA sold silica gel G (kieselgel G) as well as standardized aluminum oxide and kieselguhr *according to Stahl*. Stahl was mainly responsible for the standardization of the materials, procedures, and nomenclature of TLC.

1961

Camag began selling TLC equipment such as plate coaters, developing tanks, sample application devices, and UV lamps, and eventually became the leading company in the development of instruments for modern quantitative high performance TLC (HPTLC).

1962

E. Stahl’s first TLC book was published containing contributions by a number of TLC specialists; an expanded edition appeared in 1967. Many spray reagents were described in these books.

Planar Chromatography

The process is an inexpensive and fast separation technique. In its simplest form, it consists of a thin layer of adsorbent on glass, aluminum foil or plastic backing. The adsorbent layer can be any medium. In practice, commercially available products consist predominantly of silica gel and aluminum oxide (in their native or modified forms), cellulose and kieselguhr (diatomaceous earth). The layer thickness generally varies from 0.1 - 0.25 mm for High Performance Thin Layer Chromatography (HPTLC) up to 2 mm thickness for Preparative Thin Layer Chromatography (PTLC).

To determine if an unknown sample consists of a mixture of components, or a known mixture contains all of the intended components, small amounts of sample are transferred as "spots" or "streaks" in a horizontal manner to one side of the adsorbent layer and allowed to dry completely.

The plate is transferred to a "Development Chamber" that contains organic solvent or solvent mixture. Sample spots must remain above the solvent level. Capillary action drives the solvent up the plate over a period of 10 to 20 minutes and separates the sample mixture into its individual components. Occasionally, the correct solvent mixture may have to be determined experimentally. Literature references are a good place to start for developing the protocol that best suits the application.

Adsorbent Layers

Silica gel is by far the most predominant adsorbent layer used in TLC. That may be due to the versatility of silica gel. The typical silica gel used in TLC is an irregularly shaped 15 µm particle with 60Å pores. Also available are TLC plates with adsorbent layers made of irregular and spherical silica particles known as HPTLC plates. These spherical particles are much smaller, close to 5 µm. The advantage of a smaller spherical particle is faster analysis time and lower diffusion of the isolated components. As a result, this medium lends itself to subsequent identification by Raman spectroscopy without removing the components from the plate.

A recent development is the monolithic silica gel in which the particles are replaced with a continuous monolithic layer. Separations are even faster than with HPTLC and are completed in a few minutes. The layer is only 10 µm thick and sample capacity is proportionately low.

Other frequently used TLC layers are modified silica gel, notably those modified with hydrocarbons such as dimethyl (RP2), octyl (RP8), and octadecyl (RP18), but also silica gel modifiers such as cyanopropyl, diol, and amine. Less used sorbents are alumina, kieselguhr, cellulose and PEI cellulose. Cellulose's primary area of application is in the life science for the separation of body-fluid extracts, particularly amino acids.

For a detailed treatise on "Sorbents and Precoated Layers in Thin Layer Chromatography," see Handbook of Thin Layer Chromatography, Third Edition, J. Sherma, B. Fried, Marcel Dekker, Inc. 2003.

1968

J.A. Thomas suggested the use of smaller sorbent particles to improve TLC performance (i.e., selectivity, efficiency, and resolution).

F. Geiss and H. Schlitt describe the horizontal KS-Vario chamber that allowed testing and optimization of various mobile phases and vapor-saturation conditions.

R. Kraffczyk and R. Helger reported laboratory made biphasic plates with a lower 2 cm ion exchange zone for direct desalting of biological samples.

H. Halpaap published an important paper on the standardization of commercially precoated plates.

A book edited by E.J. Shellard, and a later (1973) book edited by J.C. Touchstone, were very important in promoting the early adoption of quantitative densitometry.

Glass, Aluminum Foil or Plastic-backed Plates

Glass-backed TLC plates are the most commonly used type of plates, but there are many practical reasons for using aluminum or plastic backed TLC plates.

- Aluminum foil and plastic are easy to cut. Instead of using a large 20 x 20 cm plate for just a few samples, a suitable width of the aluminum plate can be cut. The remaining part of the plate can be stored for another analysis.

- Isolated substances can be easily cut from an aluminum or plastic plate, then transferred to an extraction vial for subsequent work up.

- Glass is heavy and expensive to transport.

- Glass plates take up more storage space. Five glass plates take up as much space as a 25 pack of aluminum or plastic plates.

Cutting and Breaking Analytical Glass TLC Plates

Although a wide selection of prescored TLC plates is available, some researchers choose to use large 20 x 20 cm TLC plates exclusively. If the need arises, a large TLC plate can be cut to a smaller size. Depending on the specific application, one large plate can be cut to eighty (80) 1 x 2.5 cm plates size or 2,000 microscope slide plates from a box of 25.

Great care must be taken to avoid injury or waste when cutting glass TLC plates. Wear protective gear including gloves and safety glasses. Lay the glass plate, sorbent side down, onto a large sheet of filter paper on a clean, smooth, flat surface. Outline the dimensions with a suitable marker and a straight edge. Holding the straight edge where the initial cut is to be made, cut with a scoring device. (Special multiple-score cutting devices are available in craft, stained glass, or paint stores.) Next, snap along the score line with a quick pull and bend. Use of a grozier (a snapping tool much like pliers available at the above mentioned stores) is recommended.

Precut and Prescored TLC Plates

In a commercial laboratory setting, productivity is the overriding theme. To this end EMD Chemicals offers a series of different sizes of precut plates. Precut TLC plates are available in sizes of 2.5 x 7.5 cm, 5 x 10 cm, 5 x 20 cm, 10 x 10 cm, and 10 x 20 cm. Similarly, a series of prescored glass plates are commercially available as 2.5 x 10 cm, 5 x 10 cm, and 5 x 20 cm.

Precut plates are convenient and easy to use, plus prescored plates add safety and versatility to any laboratory. The plates can be used "as is" or broken down to the required size without loss of continuity in the adsorbent layer.

1968-1971

The earliest commercial densitometers for direct quantitative TLC were manufactured by Zeiss, Kontes, Camag, Turner, Schoeffel, and Vitatron.

1970

The first silica gel 60 TLC plates silanized with RP2 were produced by Merck KGaA.

D. Jaworek reported the first use of laboratory made Sephadex layers for the size exclusion TLC of proteins for molecular weight measurement.

J. Sherma initiated biennial reviews of the literature of TLC for the Fundamental Reviews issues of the American Chemical Society journal Analytical Chemistry that have continued to be published continually through 2004.

1971

L.R. Snyder described a systematic theory of adsorption chromatography involving the concepts of selectivity, resolution, and theoretical plates. Several years later he introduced the selectivity triangle, the use of which aided the choice of optimum mobile phases for TLC.

TLC or HPTLC

The predominant medium for TLC is silica gel 60, which is a silica gel particle that has a 60 Å mean pore size. In TLC, separation time and efficiency are functions of particle size and particle size distribution. In general, the mean particle size of standard TLC plates is 15 µm, while that for HPTLC plates is ~5 µm (see Fig. 1). The layer thickness for standard TLC plates is 0.25 mm (250 µm) and is 0.2 mm for HPTLC. Advantages to using HPTLC plates are:

- Faster analysis
- Higher efficiency
- Lower diffusion during sample migration
- Improved detection limit

In contrast to HPTLC, standard TLC plates have larger sample capacity. Sometimes this larger capacity allows for the use of standard TLC plates for isolation and recovery in place of the larger and more expensive preparative plates.

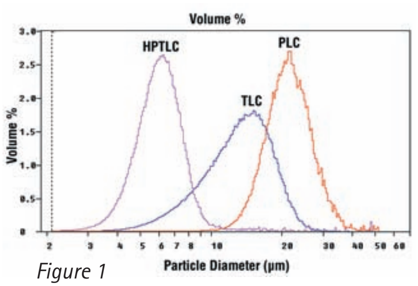


Figure 1

Polymer Bonded (Hard-Layer or Soft-Layer) Gypsum Binder TLC Plates

During the early development stages of TLC, gypsum (Plaster of Paris) was added in a 10 to 20% concentration to silica gel to bind the slurry to the glass plate. Early practitioners used this process to prepare their own plates. This bond, formed between the layer and the substrate, was very weak and chipped easily. Preserving the silica gel plates prepared with gypsum binder was difficult and often required additional precautionary steps to prevent the loss of the surface.

When TLC plates became commercially available, it became quickly apparent that a stronger binder was needed. There are a number of binders that can be used. TLC plates from EMD Chemicals are produced with 1% acrylate as a binder. This concentration is sufficient to bind the layer to the plate during shipping, but not so high as to interfere with the separation process.

The two advantages often cited for using “G” plates (plates with gypsum binder) are the ease of removing isolated fractions from the “soft” layer, and the ability of being able to char the plate with sulfuric acid. In practice these advantages are somewhat overstated. Isolated substances are easily recovered from plates containing an organic binder and “careful” charring with sulfuric acid makes it possible to differentiate between the darkened plate and the charred spots.

The big disadvantage of the softer “G” plates is that the adsorbent layer is very fragile and fractures easily. This makes it almost impossible to cut the plates into smaller sizes.

Many TLC methods developed with gypsum (G) binder plates are still referenced. The cited plates can be easily substituted with the newer polymer bound plates and often give better results. USP/NF allows gypsum, starch or other binders in the TLC plates used in their protocols.

1972

A book by F. Geiss was published that presented the theoretical and procedural aspects of TLC in detail. This book became the definitive guideline for performing TLC and is still widely used today to gain an understanding of the underlying processes of TLC.

1975

F. Eisenbeiss prepared a layer with 5 µm diameter silica gel particles for high performance TLC (HPTLC) in 1975, and commercial silica gel 60 HPTLC plates were first presented by Merck KGaA about this time.

J.A. Perry, T.H. Jupille, and L.J. Glunz introduced programmed multiple development, a method for layer development with a single solvent over increasing distances.

1978

Merck KGaA introduced RP2, RP8 and RP18 phases as precoated HPTLC plates.

1979

E. Tyihak, E. Mincsovics, and H. Kalasz described overpressured layer chromatography (OPLC) for fast separations with constant mobile phase flow and theoretical plate height over the complete layer distance.

TLC Plates with Sample Concentration Zone

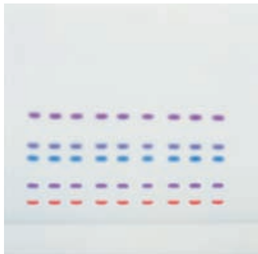
The concentration zone layer consists of a 2.5 cm band of wide-pore silica gel particles along one edge of the plate. The large pore size of this part of the layer offers no noticeable resistance to sample migration when the plate is developed. As a result, when the TLC plate is spotted with the sample anywhere in the concentration zone, it quickly moves as a sample band to the active silica gel portion of the plate where separation begins.

Using plates (with a pre-concentration zone) provide several advantages:

· Eliminates aligning samples at the origin.

· Sample fractions and corresponding standards are sure to migrate at the same speed.

· Excessive sample amounts will result in the same separation efficiency.



Water Tolerant TLC/HPLC Plates

The organic binder used in the prepared TLC and HPTLC plate is an acrylate. This is a water soluble binder which can swell the layers when used in developing solvents with high water content (generally > 50%). This is not often seen with silica gel layers, but can occur more often with bonded layer TLC plates, like a RP-18 plate.

To allow the chromatographer to get better results, Merck KGaA has reformulated some plates to be used with high water content mobile phases for both Silica Gel and RP-18 plates. These products can be found throughout the following product listing by reading the heading or comments beside each product. The letter “W” is used in the product description of these products.

1979

Camag manufactured the first monochromator-equipped densitometer, the TLC/HPTLC Scanner I.

1980

F. Kreuzig described a mechanized spraying device for application of derivatization reagents to be used for zone detection.

1981

RP8 and RP18 plates were offered as precoated TLC plates by Merck KGaA.

1984

K. Burger introduced automated multiple development (AMD) for development of layers over increasing distances with a stepwise mobile phase gradient of decreasing strength.

The first successful experiments with digital cameras for the quantitative evaluation of chromatograms were reported by M. Prosek, A. Medija, M. Katic, and R.E. Kaiser.

Preparing the TLC Plate For Use

There are two general preparation steps for TLC plates: washing and activation. It is recommended that you wash the plates before the sample is applied with the same solvent intended for the separation. This removes any substance that may have adsorbed to the plate during storage. The plate can be either totally immersed in the solvent or the solvent can be allowed to migrate up the plate in a development chamber overnight.

Activating a glass backed silica gel plate is highly recommended because it improves reproducibility of your results. This is especially important for repetitive analysis when results are compared across a span of days or weeks. Heat the glass TLC plate in a hot-air oven for 30 minutes at 110°C. Then remove the plate from the oven and immediately place it into a humidity controlled environment, such as a storage box or desiccator. Plates left out in the open will absorb moisture quickly, reversing the activation.

Activation of TLC plates on aluminum or plastic backing should be done at 90°C and should be performed on a solid metal or glass surface to ensure uniform heat distribution.

The Benefits of TLC ...

There are significant benefits in using TLC as an accessory tool to HPLC or in screening tens to hundreds of samples in a single day in high throughput applications.

· Substances that remain on the origin are easily identified and recovered, resulting in appropriate conditions to effect separation without losing the HPLC column or the sample in question.

· The type and number of solvents available for TLC chromatography has expanded to include those without UV transparency, since the solvent is evaporated before the components are elucidated.

· Detection methods other than spectrometric and spectrophotometric methods can be used to identify isolated substances.

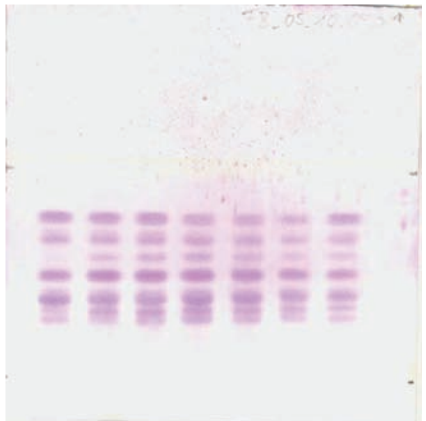
· As many as 70 samples and reference standards can be chromatographed on a single standard TLC Plate.

· Solvent consumption is minimal and sometimes as low as 10 ml for as many as 70 samples.

· Two-dimensional or multi-dimensional separations on the same TLC plate is possible by simply allowing the solvent from the first development step to evaporate, turning the plate 90 degrees, and then using a different solvent mixture to continue the separation process.

· Coupling TLC with other separation techniques or spectrophotometric methods is readily accomplished because fractions are easily recovered from the plates for subsequent analysis.

The EMD advantage: we produce our own silica gel and therefore have complete control over its purity.



1988

Analtech produced the first commercial video densitometer in 1988.

1991

J. Sherma and B. Fried edited for Marcel Dekker Inc. the first of three editions of the Handbook of Thin Layer Chromatography. These are the only books ever published that cover in detail essentially all of the important knowledge of TLC theory, techniques, instrumentation, and applications to virtually every analyte and sample type in more than 30 chapters and 1,000 pages.

Seeing the difference ... Visualization Techniques

Fluorescence Quenching - Like any separation technique, the key is to find ways to visualize or quantify the results of the separation. For TLC, one of the best ways to visualize the separation is to use the fluorescent indicator already contained in the plate (TLC Plates designated F_{254} contain a fluorescent indicator). This technique, called fluorescence quenching, results in the dark spots of the separated sample components showing up clearly against a fluorescent background.

Although use of TLC plates with fluorescence background is the most popular method to visualize isolated fractions, plates can also be impregnated with other reagents, dried and stored for future use. A few common reagents are ammonium sulfate in place of sulfuric acid, magnesium acetate, potassium oxalate and silver nitrate.

Reagent Visualization - Sometimes a special visualizer solution needs to be sprayed over the developed plate in order to form visible spots. One example would be the use of a Ninhydrin solution to visualize the resulting spots formed by the separation of amino acids.

There are hundreds of potential visualization reagents and their selection depends on the molecular structure and functional groups of the sample being studied. Refer to the following publications for additional information.

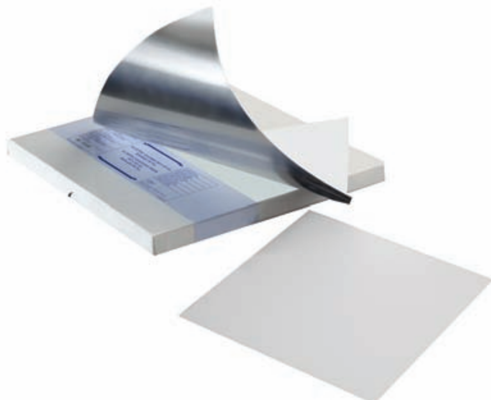
Spot Tests in Organic Chemistry, 4th reproduction, F. Fiegl & V. Anger (Elsevier, NY, 1989)

Thin Layer Chromotography, 2nd edition, Egon Stahl, editor (Springer-Verlag, NY, 1969)

TLC Reagents & Detection Methods, Vol. 1a, H. Jork & W. Funk, et al., (Wiley, NY, 1990)

EMD Chemicals has produced a TLC Visualization Guide with over 300 examples. It is now available on our website (www.emdchemicals.com/analytics) for easier accessibility and convenience. Select the TLC Visualization Reagents guide pdf and search for the type of samples you need to visualize.

Charring - One of the oldest ways to identify isolated substances on a TLC plate is by charring with sulfuric acid. After the plate has been developed and residual solvent is completely removed, it is placed in a glass housing or other protected container in a fume hood and sprayed with a fine mist of diluted sulfuric acid. The plate is subsequently placed in an oven at 150°C or on a hot plate to allow the sulfuric acid to decompose the sample spots. When using plates that contain an organic binder, lower heat is applied so as not to char the plate along with the sample spots. Optional spraying reagents are ammonium sulfate and phosphoric or phosphomolybdic acids.



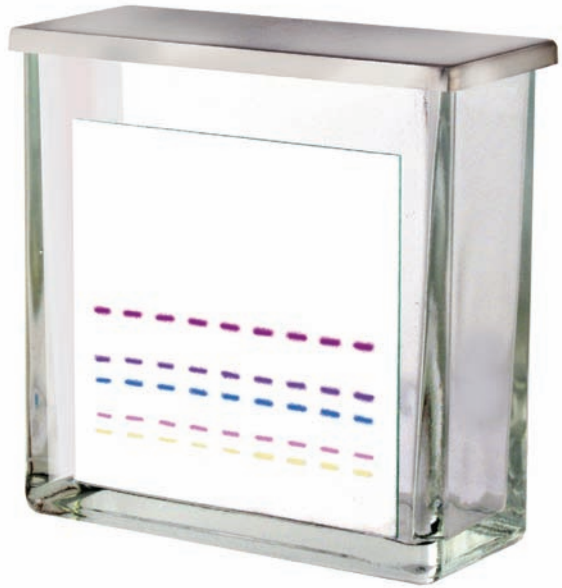
Reference:
Joseph Sherma, Thin Layer Chromatography, in A Century of Separation Science, H.J. Issaq (editor), Marcel Dekker Inc., New York, NY, 2002, pp. 49-68.
Joseph Sherma
Department of Chemistry
Lafayette College
Easton, PA 18042

Some important TLC considerations ...

Although it is not difficult to get good TLC results, the reproducibility of results is paramount. For highly consistent and reliable results, start by selecting a TLC plate from EMD Chemicals. To get started, it is recommended to always heat activate the plate before spotting it with the sample. Then, when the plate is ready to be placed into the development chamber, make sure that the chamber is lined with filter paper and has been sufficiently equilibrated with the solvent mixture.

For faster results and improved detection limits, choose the HPTLC plate that is equivalent to the TLC Plate being used. The HPTLC plates are coated with smaller particles which results in shorter development distances. TLC and HPTLC plates that have a sample concentration zone will always provide cleaner separations by converting the sample spot into a sample band. This sample band lines up the sample components into a more uniform alignment so they all begin their migration together instead of in a random staggered configuration.

For additional technical assistance for developing your TLC methodology, please visit our web site (www.emdchemicals.com) or call us at 800 222-0342.



New Products

LuxPlate® High Fluorescence TLC Plates

LuxPlate TLC Plates contain a high concentration of fluorescence indicator which has major advantages over standard TLC plates. The new LuxPlate TLC Plates provide:

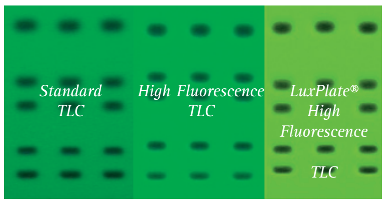
· Twice the brightness

· Improved visualization of fraction

· Higher binder content to increase layer stability

· Same separation performance as standard plates

LuxPlate TLC Plates are available in several different plate sizes including the popular 2.5 x 7.5 cm plate.



Catalog No.	Size, cm	Pkg. of	
With F_{254} indicator			
5801-1	2.5 x 7.5	100	SI60
5802-1	5 x 10	25	SI60
5803-1	5 x 20	100	SI60
5804-1	10 x 20	50	SI60
5805-1	20 x 20	25	SI60

Ultra-thin, Monolithic-layer TLC Plates

These plates are the latest in a long line of innovations in Planar Chromatography. Similar to Chromolith columns, the UTLC plates consists of a monolithic, 0.01 mm = 10 µm layer of Silica gel. The layer consists of particles with pore diameters of 30 to 40 Å and 1 to 2 µm, respectively. Advantages are:

· Nanograms of samples can be isolated and identified

· Migration distance is 1 to 3 cm

· Analysis time is 1 to 6 minutes

The medium coating these unique UTLC (Ultra-Thin TLC) plates is actually a porous layer of silica gel based on patented technology. These UTLC plates offer several key advantages over conventional and other high performance plates including:

· Dramatically shortened development time
· Elimination of any binder because the gel adheres to the plate by itself
· Very low solvent consumption
· High separation efficiency
· High analytical sensitivity
· Stability in water

5007-1 **25/pkg.**

Physical Properties	
Monolithic Layer	No particles
Plate Dimensions	60 mm X 36 mm
Layer Thickness	10 µm
Meso Pores	30 to 40 Å pore diameter
Macro Pores	1 to 2 µm pore diameter
Specific surface area	~350 m^2/g
Specific pore volume	~0.3 ml/g (meso Pores)

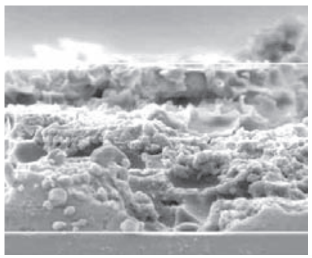


Photo showing actual monolithic gel coating structure.

TLC Glass Plates

Silica Gel 60 on Glass Plates - 0.25 mm Coating

Catalog No.	Size, cm	Pkg. of	
15326-1	2.5 x 7.5	100	Includes Box for storage
105639-5	2.5 x 7.5	500	
5724-3	5 x 20	100	
5626-6	10 x 20	50	
5721-7	20 x 20	25	
With F_{254} indicator			
15327-1	2.5 x 7.5	100	Includes Box for storage
15341-1	2.5 x 7.5	100	
15341-5	2.5 x 7.5	500	
5789-2	5 x 10	25	
5719-2	5 x 10	200	
5808-3	5 x 20	25	
5714-3	5 x 20	100	
5729-6	10 x 20	50	
5715-7	20 x 20	25	

Silica Gel 60 on Glass Plates - 0.25 mm coating; with 2.5 cm Concentration zone

Catalog No.	Size, cm	Pkg. of
11844-6	10 x 20	50
11845-7	20 x 20	25
With F_{254} indicator		
11846-6	10 x 20	50
11798-7	20 x 20	25

Silica Gel 60 with F_{254} indicator on Glass Plates - 0.25 mm Coating

Catalog No.	Size, cm	Pkg. of	
PRE-SCORED			
5608-7	20 x 20	20	Prescored to 5 x 20 cm segments
10557-1	20 x 10	25	Prescored to 5 x 20; 2.5 x 10; 5 x 20 or 5 x 10 cm segments
105620-7	20 x 20	25	Prescored to 5 x 10 cm segments

Silica Gel 60 with F_{254} indicator on Laser coded Glass Plates - 0.25 mm Coating

Catalog No.	Size, cm	Pkg. of	
Laser Coded			
105566-7	20 x 20	25	Laser coded for tracking

TLC Glass Plates

Reversed Phase (RP) Silica Gel 60 on Glass Plates - 0.25 mm Coating

Catalog No.	Bonded Phase	Size, cm	Pkg. of
5746-7	RP-2	20 x 20	25
With F_{254} indicator			
5747-7	RP-2	20 x 20	25
With F_{254s} indicator			
15684-1	RP-8	5 x 10	25
15682-3	RP-8	5 x 20	50
15424-6	RP-8	10 x 20	50
15388-7	RP-8	20 x 20	25
15685-1	RP-18 W	5 x 10	25
15683-3	RP-18 W	5 x 20	50
15423-6	RP-18 W	10 x 20	50
15389-7	RP-18 W	20 x 20	25

Silica Gel 60 W with F_{254s} indicator on Glass Plates - Water Resistant 0.20 mm Coating

Catalog No.	Size, cm	Pkg. of
16485-1	20 x 20	25

Silica Gel 40 with F_{254} indicator on Glass Plates - 0.25 mm Coating

Catalog No.	Size, cm	Pkg. of
5634-7	20 x 20	25

Kieselguhr with F_{254} indicator on Glass Plates - 0.2 mm Coating

(Silica Gel/Kieselguhr/Diatomaceous Earth)

Catalog No.	Size, cm	Pkg. of	
5738-7	20 x 20	25	Kieselguhr
5737-7	20 x 20	25	Silica Gel 60 - Kieselguhr

Aluminum Oxide 60 (Basic) with F_{254} indicator on Glass Plates - 0.25 mm Coating

Catalog No.	Size, cm	Pkg. of
5731-3	5 x 20	100
5713-7	20 x 20	25

Aluminum Oxide 150 (Basic) with F_{254} indicator on Glass Plates - 0.25 mm Coating

Catalog No.	Size, cm	Pkg. of
5727-7	20 x 20	25

Cellulose on Glass Plates - 0.1 mm Coating

Catalog No.	Size, cm	Pkg. of
5632-5	10 x 10	100
5730-6	10 x 20	50
5716-7	20 x 20	25

Cellulose F on Glass Plates - 0.1 mm Coating

Catalog No.	Size, cm	Pkg. of
5728-6	10 x 20	50
5718-7	20 x 20	25

PEI Cellulose F on Glass Plates - 0.1 mm Coating

Catalog No.	Size, cm	Pkg. of	
5725-7	20 x 20	25	Store at 4°C

TLC Aluminum Sheets

Silica Gel 60 on Aluminum Sheets - 0.2 mm Coating

Catalog No.	Size, cm	Pkg. of
16835-2	5 x 10	50
5553-7	20 x 20	25
With F_{254} indicator		
5549-4	5 x 7.5	20
16834-2	5 x 10	50
5534-3	5 x 20	100
5554-7	20 x 20	25
5562-7	500 x 20	1 Roll

Silica Gel 60 on Aluminum Sheets - 0.2 mm Coating with 2.5 cm Preconcentration Zone

Catalog No.	Size, cm	Pkg. of
5582-7	20 x 20	25
With F_{254} indicator		
5583-7	20 x 20	25

Silica Gel 60 W on Aluminum Sheets - Water Resistant 0.20 mm Coating

Catalog No.	Size, cm	Pkg. of
16487-1	20 x 20	25
With F_{254} indicator		
16484-1	20 x 20	25

Kieselguhr with F_{254} indicator on Aluminum Sheets - 0.2 mm Coating
(Silica Gel/Kieselguhr/Diatomaceous Earth)

Catalog No.	Size, cm	Pkg. of	
5568-7	20 x 20	25	Kieselguhr
5567-7	20 x 20	25	Silica Gel 60
105533-7	20 x 20	20	Silica Gel NH_2

Aluminum Oxide 60 (Neutral) with F_{254} indicator Aluminum Sheets - 0.2 mm Coating

Catalog No.	Size, cm	Pkg. of
5550-7	20 x 20	25

Aluminum Oxide 150 (Neutral) with F_{254} indicator Aluminum Sheets - 0.2 mm Coating

Catalog No.	Size, cm	Pkg. of
5551-7	20 x 20	25

Cellulose on Aluminum Sheets - 0.1 mm Coating

Catalog No.	Size, cm	Pkg. of
5552-7	20 x 20	25
5563-7	500 x 20	1 Roll
With F_{254} indicator		
5574-7	20 x 20	25

TLC Plastic Sheets

Silica Gel 60 on Plastic Sheets - 0.2 mm Coating

Catalog No.	Size, cm	Pkg. of
5748-7	20 x 20	25
With F_{254} indicator		
5735-7	20 x 20	25
5749-7	500 x 20	1 Roll

Aluminum Oxide 60 (Neutral) with F_{254} indicator on Plastic Sheets - 0.25 mm Coating

Catalog No.	Size, cm	Pkg. of
5581-7	20 x 20	25

Cellulose on Plastic Sheets - 0.1 mm Coating

Catalog No.	Size, cm	Pkg. of
5577-7	20 x 20	25
With F_{254} indicator		
5565-7	20 x 20	25

PEI Cellulose with F_{254} indicator on Plastic Sheets - 0.1 mm Coating

Catalog No.	Size, cm	Pkg. of	
5579-7	20 x 20	25	Store at 4°C

Letter and Number Definitions

AMD	Automated multiple development after Camag
CHIR	Chiral layer for separating enantiomers of amino acids
CN	Hydrophilic layer with cyano modification
DIOL	Hydrophilic layer with diol modification
F	Containing fluorescent indicator
H (bulk sizes)	Containing no foreign binders
HR (bulk sizes)	Specially purified
NH2	Hydrophilic layer with amino modification
P	For preparative layers
PEI	Polyethyleneimine
PLC	Preparative layer chromatography
R	Specially purified
Silanized RP-2	Reversed phase with a dimethylsilyl chain
RP-8	Reversed phase with a C8 hydrocarbon chain
RP-18	Reversed phase with a C18 hydrocarbon chain
Silica Gel 60Å	Silica gel with a mean pore size of 60 Angstrom
TLC	Thin layer chromatography
W	Water tolerant wettable layer
40, 60, etc.	Mean pore size in Å
Prescored	Plate can be broken down into smaller plates
Preconcentration zone	An area of the TLC plate composed of silica gel of large, 50,000 Å, pore size

Preparative TLC Glass Plates

PTLC Silica Gel 60 on Glass Plates

Catalog No.	Size, cm	Pkg. of	Indicator	Layer Thickness
13894-7	20 x 20	20	None	0.5mm
5744-7	20 x 20	20	F_{254}	0.5mm
13895-7	20 x 20	15	F_{254}	1 mm
5745-7	20 x 20	12	None	2mm
5717-7	20 x 20	12	F_{254}	2mm
5637-7	20 x 20	12	$F_{254+366}$	2mm

PTLC Silica Gel 60 on Glass Plates - 1 mm Water Resistant Coating Chemically Modified Layers

Catalog No.	Bonded Phase	Size, cm	Pkg. of	Indicator
5434-7	RP-18 W	20 x 20	15	F_{254s}

PTLC Silica Gel 60 with F_{254} indicator on Glass Plates With 4 x 20 cm Preconcentration Zone

Catalog No.	Size, cm	Pkg. of	Layer Thickness
13792-7	20 x 20	15	1 mm
13793-7	20 x 20	12	2mm
13794-7	20 x 20	20	0.5mm

PTLC Aluminum Oxide 60 with F_{254} indicator on Glass Plates - 1.5 mm Coating

Catalog No.	Size, cm	Pkg. of
5788-7	20 x 20	12

PTLC Aluminum Oxide 150 with F_{254} indicator on Glass Plates - 1.5 mm Coating

Catalog No.	Size, cm	Pkg. of
5726-7	20 x 20	12

Fluorescent Indicator

9182-1	50g bottle of F_{254} Fluorescent Indicator, for use with any TLC plates

HPTLC/TLC Devices - UV Light

The portable UV lights are only 1x3.5x6" in size and are battery operated (Batteries not included, requires 5 "C" size). They are easily taken into the field or used in the laboratory.

13203-1	Portable UV Light, 366 nm	1 Piece, complete
12537-1	Portable UV Light, 254 nm	1 Piece, complete

TLC Book

This book on thin layer chromatography gives many of the essentials of the technique. It is ideal for the beginner or for those people needing a general review of the various techniques used today in TLC. (66 pages)

1000-1	Thin Layer Chromatography: An Introduction, K. Bauer, L. Gross and W. Sauer Merck KGaA, Darmstadt, Germany, 1990

TLC Learning Program

An attractively priced computer-based interactive learning program for TLC and HPTLC.

960314-1	Modern Thin Layer Chromatography (3.5" diskettes, 1.44MB, only; for PC, IBM, XT, AT, PS/2 or compatible, 8MB required for installation, 572KB RAM, EGA, VGA or compatible, MS-DOS, 3.3 and above)

HPTLC Glass Plates

HPTLC Silica Gel 60 on Glass Plates - 0.2 mm Coating

Catalog No.	Size, cm	Pkg. of
5631-5	10 x 10	25
5633-5	10 x 10	100
5641-6	10 x 20	50
116436-1	20 x 20	25
With F_{254} indicator		
105616-2	5 x 10	25
5628-5	10 x 10	25
5629-5	10 x 10	100
5642-6	20 x 10	50
115534-1	20 x 20	25
With F_{254s} indicator		
15696-6	10 x 20	25

HPTLC Silica Gel 60 on Glass Plates - 0.2 mm Coating with 2.5 cm Concentration Zone

Catalog No.	Size, cm	Pkg. of
13748-5	10 x 10	25
13749-6	20 x 10	50
With F_{254} indicator		
13187-1	5 x 10	25
13727-5	10 x 10	25
13728-6	20 x 10	50

HPTLC Silica Gel 60 on Glass Plates - 0.2 mm Coating

Catalog No.	Size, cm	Pkg. of	
Prescored			
5644-5	10 x 10	25	Prescored to 5 x 5 cm segments
With F_{254} indicator			
5635-5	10 x 10	25	Prescored to 5 x 5 cm segments

HPTLC Silica Gel 60 with F_{254} indicator on Glass Plates - 0.25 mm Coating

Catalog No.	Size, cm	Pkg. of	
Laser Coded			
105564-5	10 x 10	25	Laser coded for tracking
5613-6	10 x 20	25	Laser coded for tracking

HPTLC Silica Gel 60 W with F_{254s} indicator on Glass Plates - Water Resistant Coating

Catalog No.	Size, cm	Pkg. of	
1.05646.0001	20 x 10	25	Lichrospher® 6-8 mm particle size - RP18 bonded 0.2 mm coating
1.12363.0001	20 x 20	25	Suitable for AMD 0.1 mm coating

HPTLC Glass Plates

HPTLC Silica Gel 60 on Glass Plates - 0.25 mm Coating

Catalog No.	Size, cm	Pkg. of	Bonded Phase	Fluorescent Indicator
14101-1	10 x 10	25	CHIR	None
16464-5	10 x 10	25	CN	F_{254s}
12571-6	10 x 20	25	CN	F_{254s}
12668-5	10 x 10	25	DIOL	F_{254s}
12572-6	10 x 20	25	NH_2	None
15647-5	10 x 10	25	NH_2	F_{254s}
13726-5	10 x 10	25	RP-2	F_{254s}
13725-5	10 x 10	25	RP-8	F_{254s}
5914-6	10 x 20	25	RP-18	None
13724-5	10 x 10	25	RP-18	F_{254s}
15498-6	20 x 10	25	RP-18	F_{254s}

HPTLC Silica Gel 60 with Chemically Modified Layers on Glass Plates - 0.2 mm Coating

With 2.5 cm Pre-Concentration Zone

Catalog No.	Bonded Phase	Size, cm	Pkg. of	
15037-6	RP-18	20 x 10	25	For PAH detection in drinking water

HPTLC Silica Gel 60 with Chemically Modified Layers on Glass Plates

0.2 mm Water Resistant Coating

Catalog No.	Bonded Phase	Size, cm	Pkg. of	Fluorescent Indicator
14296-6	RP-18 W	10 x 20	25	None
13124-1	RP-18 W	10 x 10	25	F_{254s}

Specialty HPTLC Silica Gel 60 on Glass Plates

Catalog No.	Size, cm	Pkg. of	Description
15552-6	10 x 20	25	F_{254s} indicator with Water Resistant 0.2 mm Coating - for AMD
1.12363.0001	20 x 10	25	F_{254s} indicator with Water Resistant 0.1 mm Coating - for AMD
11764-6	10 x 20	25	F_{254s} indicator with 0.1 mm Coating - for AMD
5787-5	10 x 10	25	No indicator with 0.1 mm Coating
15036-6	10 x 20	50	F_{254s} indicator Cellulose - 0.1 mm Coating
115445-1	20 x 10	25	F_{254s} indicator on LiChrospher® HPTLC
5007-1	60 x 36mm	25	No indicator - Ultra Thin Plate, Chromolith Silica UTLC
5613-6	20 x 10	25	F_{254} indicator for GLP with 2 mm coating GLP HPTLC

HPTLC Aluminum Sheets

HPTLC Silica Gel 60 on Aluminum Sheets - 0.2 mm Coating

Catalog No.	Size, cm	Pkg. of
5547-7	20 x 20	25
With F_{254} indicator		
5556-4	5 x 7.5	20
5548-7	20 x 20	25

HPTLC Silica Gel 60 with F_{254s} indicator on Aluminum Sheets - 0.2 mm Coating

Bonded Phase	Catalog No.	Size, cm	Pkg. of
Chemically Modified Layers			
RP-18	5560-4	5 x 7.5	20
RP-18	5559-7	20 x 20	20

Specialty HPTLC Silica Gel 60 on Aluminum Sheets

Catalog No.	Size, cm	Pkg. of	Indicator	Specialty
105543-1	10 x 10	25	F_{254s}	Raman 6-8µm - 0.1 mm Coating
105586-1	20 x 20	25	F_{254s}	LiChrospher® 3-5 µm - 0.1mm Coating

HPTLC Cellulose on Aluminum Sheets - 0.1 mm Coating

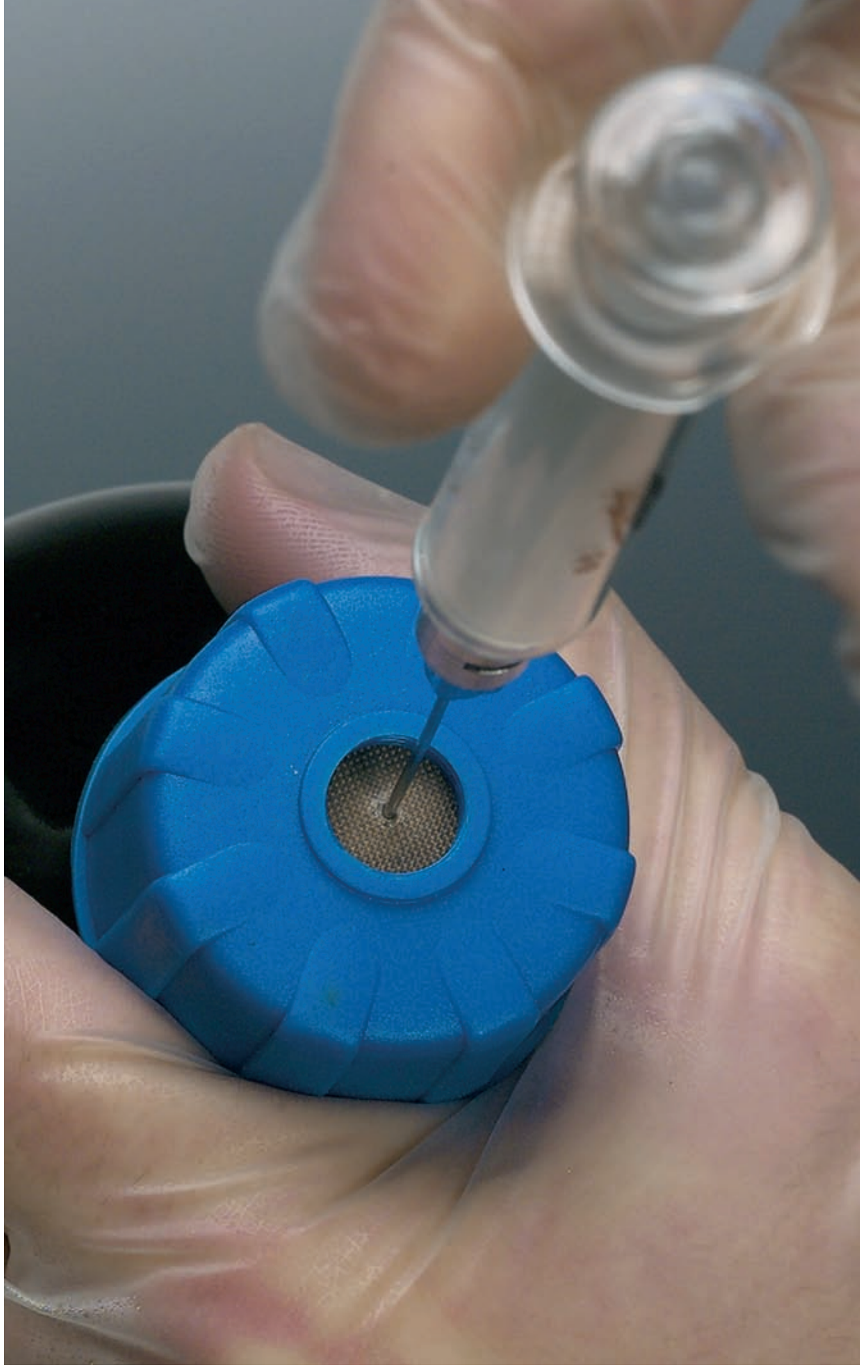
Catalog No.	Size, cm	Pkg. of
5786-6	10 x 20	50
16092-1	20 x 20	25
With F_{254} indicator		
15035-5	10 x 10	25

DriSolv®
Anhydrous Solvents

EMD Chemicals is a recognized leader in the production of high purity solvents. We use that experience to produce the highest quality anhydrous solvents. With a water content as low as 10 ppm for some solvents, our DriSolv® solvents provide a reliable basis for water critical synthesis and research work.

All DriSolv® solvents are packed under nitrogen and sealed with our Pureseal® septa, which ensures that the solvent will stay dry during use. These unique septa have been designed to reseal after every use and are chemically inert. The large surface area enables access for more than one cannula and multiple reclosing options, making it easy to deliver the driest solvents to any type of reaction vessel.

In addition to the standard 100 ml and 1L bottles for laboratory use, our DriSolv® solvents are available in stainless steel EM ReCycler® containers in sizes from 18.9L to 1,250L.



Acetonitrile, DriSolv®

Methyl cyanide

CH_3CN

Specifications:

Appearance............................ clear, free from particulates
Assay (GC), % .... ≥ 99.8
Color (APHA) .... ≤ 10
Evaporation residue, ppm .... ≤ 1
Water, ppm.. ≤ 50

Item	Size
AX0143-6	1L
	6 x 1L
AX0143-7	100 ml
	6 x 100 ml

Alcohol, Reagent, DriSolv®

CH_3CH_2OH

Specifications:

Appearance............................ clear, free from particulates
Assay (GC), %....................................Ethanol 89.5 - 91.5%
Methanol 3.5 -
5.5%
Isopropanol 4.0 - 6.0%
Color (APHA) .... ≤ 10
Residue after evaporation, ppm.................................. ≤ 5
Water, ppm.. ≤ 50

Item	Size
AX0447-6	1L
	6 x 1L
AX0447-7	100 ml
	6 x 1L

Benzene, DriSolv®

C_6H_6

Specifications:

Appearance............................ clear, free from particulates
Assay (GC), % .... ≥ 99.8
Color (APHA) .... ≤ 10
Evaporation residue, ppm .... ≤ 5
Water, ppm.. ≤ 30

Item	Size
BX0214-6	1L
	6 x 1L
BX0214-7	100 ml
	6 x 100 ml

Chloroform, DriSolv®

Trichloromethane

Stabilized with ~ 1% ethanol

$CHCl_3$

Specifications:

Appearance............................ clear, free from particulates
Assay ($CHCl_3$ + C_2H_5OH, GC), %.......................... ≥ 99.8
Color (APHA) .... ≤ 10
Evaporation residue, ppm... .... ≤1
Water, ppm.. ≤ 50

Item	Size
CX1056-6	1L
	6 x 1L
CX1056-7	100 ml
	6 x 100 ml

Assay (GC), % ≥ 99
Color (APHA)...≤ 10
Evaporation residue, ppm ....≤ 5
Water, ppm...≤ 50

Item	Size
CX1057-6 HDS	1L
	6 x 1L
CX1057-7 HDS	100 ml
	6 x 100 ml

Not Your Ordinary Bottle Cap!

Chloroform, DriSolv®

Trichloromethane

Stabilized with ~ 200ppm alkene

$CHCl_3$

Specifications:

Appearance	clear, free from particulates
Assay (GC), %	≥ 99
Color (APHA)	≤ 10
Evaporation residue, ppm	≤ 3
Water, ppm	≤ 50

Item	Size
CX1057-6	1L
	6 x 1L
CX1057-7	100 ml
	6 x 1L

Cyclohexane, DriSolv®

C_6H_{12}

Specifications:

Appearance	clear, free from particulates
Assay (GC), %	≥ 99.5
Color (APHA)	≤ 10
Evaporation residue, ppm	≤ 5
Water, ppm	≤ 50

Item	Size
CX2284-6	1L
	6 x 1L

1,2-Dichlorobenzene, DriSolv®

$C_6H_4Cl_2$

Specifications:

Appearance	clear, free from particulates
Assay (GC), %	≥ 99
Color (APHA)	≤ 10
Evaporation residue, ppm	≤ 3
Water, ppm	≤ 50

Item	Size
DX0682-6	1L
	6 x 1L

1,2-Dichloroethane, DriSolv®

Ethylene dichloride

CH_2ClCH_2Cl

Specifications:

Appearance	clear, free from particulates
Assay (GC), %	≥ 99.8
Color (APHA)	≤ 10
Evaporation residue, ppm	≤ 3
Water, ppm	≤ 50

Item	Size
DX0794-6	1L
	6 x 1L
DX0794-7	100 ml
	6 x 100 ml

Dichloromethane, DriSolv®

Methylene chloride

CH_2Cl_2

Stabilized with an alkene

Specifications:

Appearance	clear, free from particulates
Assay (GC), %	≥ 99.8
Color (APHA)	≤ 10
Evaporation residue, ppm	≤ 1
Water, ppm	≤ 50

Item	Size
DX0834-6	1L
	6 x 1L
DX0834-7	100 ml
	6 x 100 ml

1,2-Dimethoxyethane, DriSolv®

Ethylene glycol dimethyl ether, Dimethyl glycol

$CH_3OCH_2CH_2OCH_3$

Specifications:

Appearance	clear, free from particulates
Assay (GC), %	≥ 99.5
Color (APHA)	≤ 10
Evaporation residue, ppm	≤ 5
Water, ppm	≤ 50

Item	Size
DX1531-6	1L
	6 x 1L

N,N-Dimethylacetamide, DriSolv®

Acetic acid dimethylamide

$CH_3CON(CH_3)_2$

Specifications:

Appearance	clear, free from particulates
Assay (GC), %	≥ 99.8
Color (APHA)	≤ 10
Evaporation residue, ppm	≤ 10
Water, ppm	≤ 50

Item	Size
DX1544-6	1L
	6 x 1L

N,N-Dimethylformamide, DriSolv®

Formic acid dimethylamide

$HCON(CH_3)_2$

Specifications:

Appearance	clear, free from particulates
Assay (GC), %	≥ 99.8
Color (APHA)	≤ 10
Evaporation residue, ppm	≤ 5
Water, ppm	≤ 50

Item	Size
DX1727-6	1L
	6 x 1L
DX1727-7	100 ml
	6 x 100 ml

p-Dioxane, DriSolv®

$C_4H_8O_2$

Unstabilized

Specifications:

Appearance	clear, free from particulates
Assay (GC), %	≥ 99.9
Color (APHA)	≤ 10
Peroxide, ppm	≤2 (at time of filling)
Evaporation residue, ppm	≤5
Water, ppm	≤ 50

Item	Size
DX2092-6	1L
	6 x 1L
DX2092-7	100 ml
	6 x 1L

Ethyl Acetate, DriSolv®

$CH_3COOC_2H_5$

Specifications:

Appearance	clear, free from particulates
Assay (GC), %	≥ 99.9
Color (APHA)	≤ 10
Evaporation residue, ppm	≤1
Water, ppm	≤ 50

Item	Size
EX0237-6	1L
	6 x 1L
EX0237-7	100 ml
	6 x 100ml

Ethyl Ether, DriSolv®

$(CH_3CH_2)_2O$
Stabilized with ~ 1ppm BHT

Specifications:

Appearance	clear, free from particulates
Assay (GC), %	≥ 99.8
Color (APHA)	≤ 10
Peroxide, ppm	≤ 1
Evaporation residue, ppm	≤ 3
Water, ppm	≤ 50

Item	Size
EX0194-6	1L
	6 x 1L
EX0194-7	100 ml
	6 x 100 ml

n-Hexane, 95%, DriSolv®

C_6H_{14}

Specifications:

Appearance	clear, free from particulates
Assay (n-Hexane) (GC), %	≥ 95
Color (APHA)	≤ 10
Evaporation residue, ppm	≤ 3
Water, ppm	≤ 50

Item	Size
HX0304-6	1L
	6 x 1L
HX0304-7	100 ml
	6 x 100 ml

Isopropyl Alcohol, DriSolv®

$CH_3CHOHCH_3$

Specifications:

Appearance	clear, free from particulates
Assay (GC), %	≥99.9
Color (APHA)	≤10
Evaporation residue, ppm	≤1
Water, ppm	≤50

Item	Size
PX1827-6	1L
	6 x 1L
PX1827-7	100 ml
	6 x 1L

Methanol, DriSolv®

Methyl alcohol

CH_3OH

Specifications:

Appearance	clear, free from particulates
Assay (GC), %	≥ 99.8
Color (APHA)	≤ 10
Evaporation residue, ppm	≤ 1
Water, ppm	≤ 50

Item	Size
MX0472-6	1L
	6 x 1L
MX0472-7	100 ml
	6 x 100 ml

Methyl Sulfoxide, DriSolv®

Dimethyl sulfoxide

$(CH_3)_2SO$

Specifications:

Appearance	clear, free from particulates
Assay (GC), %	≥ 99.8
Color (APHA)	≤ 10
Evaporation residue, ppm	≤ 5
Water, ppm	≤ 50

Item	Size
MX1457-6	1L
	6 x 1L
MX1457-7	100 ml
	6 x 100 ml

Pentane, DriSolv®

C_5H_{12}

Specifications:

Appearance	clear, free from particulates
Assay (GC), %	≥ 99
Color (APHA)	≤ 10
Evaporation residue, ppm	≤ 3
Water, ppm	≤ 50

Item	Size
PX0171-6	1L
	6 x 1L
PX0171-7	100 ml
	6 x 100 ml

Pyridine, DriSolv®

C_5H_5N

Specifications:

Appearance	clear, free from particulates
Assay (GC), %	≥ 99.8
Color (APHA)	≤ 10
Evaporation residue, ppm	≤ 5
Water, ppm	≤ 50

Item	Size
PX2012-6 HDS	1L
	6 x 1L
PX2012-7 HDS	100 ml
	6 x 100 ml

Tetrahydrofuran, DriSolv®

Unstabilized

C_4H_8O

Specifications:

Appearance	clear, free from particulates
Assay (GC), %	≥ 99.9
Color (APHA)	≤ 10
UV cutoff, nm	212
Water, ppm	≤ 50

Item	Size
TX0277-6 HDS	1L
	6 x 1L
TX0277-7 HDS	100 ml
	6 x 100 ml

Tetrahydrofuran, DriSolv®

Stabilized with ~ 25 ppm BHT

C_4H_8O

Specifications:

Appearance .... clear, free from particulates
Assay (GC), % .... ≥ 99.9
Color (APHA) .... ≤ 10
Water, ppm .... ≤ 50

Item	Size
TX0284-6 HDS	**1L**
	6 x 1L
TX0284-7 HDS	**100 ml**
	6 x 100 ml

Toluene, DriSolv®

Methylbenzene

$C_6H_5CH_3$

Specifications:

Appearance .... clear, free from particulates
Assay (GC), % .... ≥ 99.8
Color (APHA) .... ≤ 10
Evaporation residue, ppm .... ≤ 5
Water, ppm .... ≤ 50

Item	Size
TX0732-6 HDS	**1L**
	6 x 1L
TX0732-7 HDS	**100 ml**
	6 x 100 ml

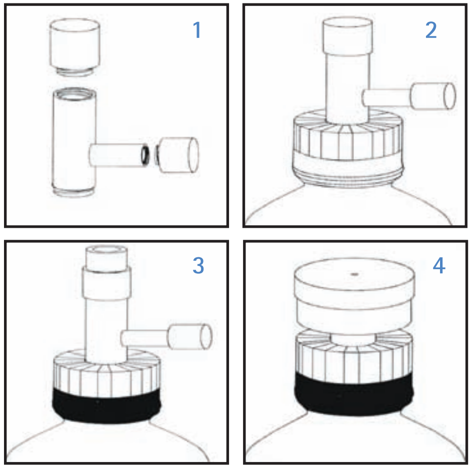
DriSolv® Solvent Bottle Accessories

1. Elbow adapter for use with nitrogen purge. Supplied with plugs and secondary septa to reseal after use. Available as item #692004-2. Replacement plug for bottle top available as item #692012-2.

2. Elbow adapter threaded into bottle cap.

3. Elbow adapter shown with secondary septum, six supplied with item #692004-2. Secondary replacement septa available as item #692004S-2.

4. Drying tube to maintain low moisture level inside the bottle when removing solvent without inert gas flow. Available as item #692010-2.



ELBOW ADAPTER with SEPTUM CAP

For solvent withdrawal under nitrogen purge. Secondary septum cap reduces leakage after primary septum has been punctured.

Item	Size
692004-2	**1 unit**

SECONDARY REPLACEMENT SEPTA

Pack of ten replacement septa, for use with elbow adapter.

Item	Size
692004S-2	**1 pkg**

DRYING TUBE

Supplied with 250 g of t.h.e.® desiccant, 100% indicating silica gel item #DX0017 to maintain low moisture content when withdrawing solvent. Other Drying Agents can be used as desired.

Item	Size
692010-2	**1 unit**

LARGE PLUG

Replacement plug for bottle top.

Item	Size
692012-2	**1 unit**

Extrelut® QE Columns

Extrelut QE Columns are pre-packed with diatomaceous earth for rapid sample cleanup. They are a substitute for liquid-liquid extraction. After pH adjustment (traditional liquid-liquid extraction techniques) and adding sodium chloride (for salting out), the aqueous sample is adsorbed onto the diatomaceous earth in the Extrelut column. Elution of the desired components is then accomplished by elution with a pure or mixture of solvents (e.g. ethyl acetate, diethyl ether, chloroform, toluene, etc.) that would be immiscible with the water adsorbed on its matrix.

Using a column version of liquid-liquid extraction is a much easier, quicker way to remove contaminants and allow cleaner, more reproducible LC, GC, and TLC analyses. For papers using these in various protocols, search PubMed on the internet, then search Extrelut on the PubMed site.

It is important to order the correct size column to hold the volume you desire to place on the column. If you have a 10 ml aqueous sample, you need to order a 10 ml Extrelut column. Unlike solid phase extraction (SPE) columns, these columns have no silanols or bonded phase to absorb specific compounds.

Catalog No.	Description
901000-1	Extrelut® QE Column, 0.3 ml. For Sample Preparation
901001-1	Extrelut® QE Column, 1 ml. For Sample Preparation
901003-1	Extrelut® QE Column, 3 ml. For Sample Preparation
901005-1	Extrelut® QE Column, 5 ml. For Sample Preparation
901010-1	Extrelut® QE Column, 10 ml. For Sample Preparation
901020-1	Extrelut® QE Column, 20 ml. For Sample Preparation
902050-1	Extrelut® QE Column, 50 ml. For Sample Preparation
903020-1	Extrelut® QE Column, Unbuffered, 20 ml. For Sample Preparation
903110-1	Extrelut® QE Column, Buffered to pH 9.0, 10 ml. For Sample Preparation
903120-1	Extrelut® QE Column, Buffered to pH 9.0, 20 ml. For Sample Preparation
903220-1	Extrelut® QE Column, Buffered to pH 4.5, 20 ml. For Sample Preparation

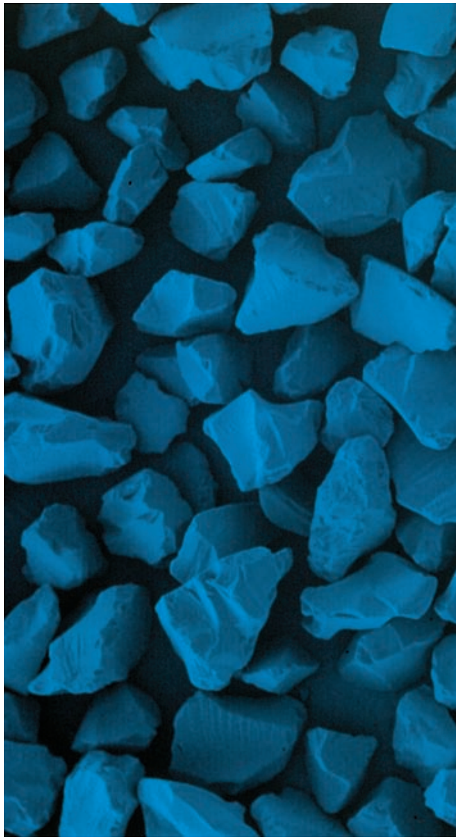
We Begin by Producing the Highest Quality Chromatography Grade Silica ...

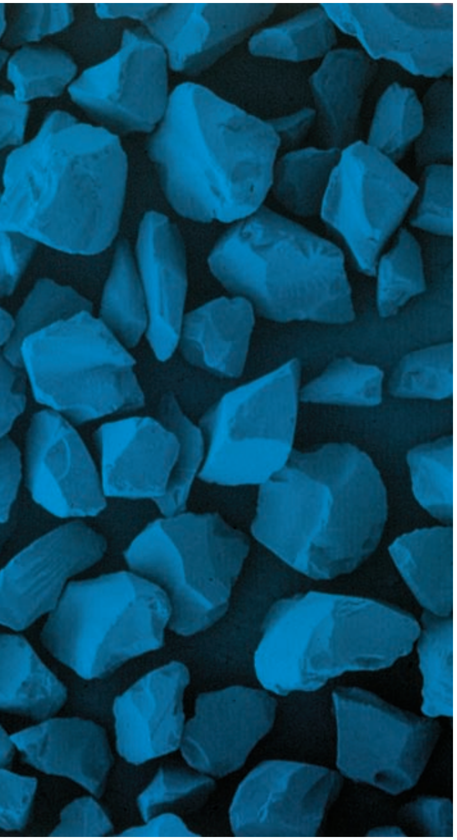
Every batch is closely monitored and controlled to provide the pore size, density, pore volume, surface area, and pore size distribution required for chromatographic applications. From these large parent batches, we derive unique silica preparations specific to a variety of classes of Silica Gel 60 products.

LiChrosorb®: This analytical grade of irregular materials comes in 5 µm and 10 µm particle sizes for use in HPLC and is available in a wide range of bonded phases.

Standardized Silica Gels: These silica gel products are the work horses for Flash chromatography, industrial scale LC and batch adsorption applications. They offer small particle size distribution ranges and are available in three different size ranges: 40-63 µm, 63-200 µm and 200-500 µm.

Geduran®: This class of silica gel is made from wider cuts of the same high performance, high quality base material. The wider particle size distribution allows for the same quality at a more competitive cost. It is available in two nominal size ranges: 40-63 µm and 63-200 µm. This class is often selected for less critical Flash chromatography and classical LC applications.





All these products exhibit the same selectivity characteristics as determined by the parent silica, which is also used to manufacture our renowned range of TLC plates. Using EMD Chemicals' TLC plates and EMD Chemicals' silica gels guarantees no selectivity surprises when scaling from TLC to column chromatography.

To extend the range of our irregular silica materials and address some specific needs, we also offer Silica Gel 40 and Silica Gel 100 products which have different mean pore sizes of 40 Angstroms and 100 Angstroms, respectively. The different pore size results in a change in surface areas, pore size distributions, and in the bulk density of the materials which makes them more suited to certain specific applications. However, they are manufactured and tested to the same standards of quality and purity as our Silica Gel 60 products.

To complement this range of silicas, we also produce LiChrospher® spherical material for High Performance Preparative Chromatography applications. Because the material is made in very high production volumes, the resulting lot sizes make LiChrospher® silica ideally suited for large scale use in the industrial purifications of high quality chemicals and pharmaceuticals. LiChrospher® is available in 60, 100 and 300 Angstrom pore sizes and bonded C8 and C18 silica gel. Our RPselect B is a base deactivated C8 bonded LiChrospher® material for the separation of the basic drug compounds found in the Pharmaceutical industry today. The 300 Angstrom material is ideally suited to small protein and peptide purification.

Adsorbents for Analytical and Preparative Thin Layer Chromatography

Catalog No.	Description	Use	pH*	Size
Particle Size 5-40 µm				
7731-1	Silica Gel 60 G	TLC	7.0	500g
7731-3	Silica Gel 60 G	TLC	7.0	1kg
11677-3	Silica Gel 60 G**	TLC	7.0	1kg
7730-5	Silica Gel 60 G F_{254}	TLC	7.0	5kg
7741-3	Silica Gel 60 H $F_{254+366}$	TLC	7.0	1kg
7744-1	Silica Gel 60 HR Extra Pure	TLC	7.0	500g
7749-3	Silica Gel 60 P F_{254} with Gypsum	PLC	7.0	1kg
7749-2	Silica Gel 60 P F_{254} with Gypsum	PLC	7.0	2.5kg
Particle Size <63 µm				
7729-3	Silica Gel 60	TLC	7.0	1kg
7729-5	Silica Gel 60	TLC	7.0	5kg
Aluminum Oxide Particle Size 5-40 µm				
1090-9	Aluminum Oxide 60 G Neutral	TLC	7.5	25kg
1092-1	Aluminum Oxide 60 G F_{254} Neutral	TLC	7.5	500g
1097-3	Aluminum Oxide 90, Basic	TLC	7.5	1kg
7719-1	Silica Gel 60	TLC	7.0	250g
7719-3	Silica Gel 60	TLC	7.0	1kg
Additional TLC Adsorbent Particle Size 50-40 µm				
8129-1	Kieselguhr G	TLC	7.0	500g

*pH of a 10% aqueous suspension

**Mean particle size is 15 µm

Adsorbents for Preparative Column Chromatography (Fe <0.02%, Cl <0.02%)

Catalog No.	Description	Mesh Size	pH*	Pkg. of
Particle Size 15-40 µm				
15111-1	Silica Gel 60	350-600	7.0±0.5	500g
15111-3	Silica Gel 60	350-600	7.0±0.5	1kg
Particle Size 40-63 µm				
9385-3	Silica Gel 60	230-400	7.0±0.5	1kg
9385-4	Silica Gel 60	230-400	7.0±0.5	2.5kg
9385-5	Silica Gel 60	230-400	7.0±0.5	5kg
9385-9	Silica Gel 60	230-400	7.0±0.5	25kg
Particle Size 60-160 µm				
10601-1	Kieselguhr			500g
Particle Size 63-200 µm				
10180-3	Silica Gel 40	70-230	5.5±0.5	1kg
7734-3	Silica Gel 60	70-230	7.0±0.5	1kg
7734-4	Silica Gel 60	70-230	7.0±0.5	2.5kg
7734-7	Silica Gel 60	70-230	7.0±0.5	25kg
7754-1	Silica Gel 60 Extra Pure	70-230	6.5±0.5	500g
7754-3	Silica Gel 60 Extra Pure	70-230	6.5±0.5	1kg
10184-5	Silica Gel 100	70-230	6.5	5kg
Particle Size 200-500 µm				
10181-3	Silica Gel 40	35-70	5.5±0.5	1kg
7733-1	Silica Gel 60	35-70	7.0±0.5	500g
7733-3	Silica Gel 60	35-70	7.0±0.5	1kg
7733-5	Silica Gel 60	35-70	7.0±0.5	5kg
7733-9	Silica Gel 60	35-70	7.0±0.5	25kg
10185-1	Silica Gel 100	35-70	6.5	500g

Adsorbents for Analytical and Preparative Thin Layer Chromatography

Catalog No.	Description	Particle Size	Size
10167-3	Silica Gel 60 RP18	40-63 µm	100g

Geduran® Silica Gel 60

Catalog No.	Description	pH	Size
Particle Size 40-63 µm			
11567-2	Silica Gel 60	7.0±0.5	500g
11567-3	Silica Gel 60	7.0±0.5	1kg
11567-6	Silica Gel 60	7.0±0.5	2kg
11567-4	Silica Gel 60	7.0±0.5	2.5kg
11567-5	Silica Gel 60	7.0±0.5	5kg
11567-1	Silica Gel 60	7.0±0.5	25kg
Particle Size 63-200 µm			
110832-3	Silica Gel 60	7.0±0.5	1kg
110832-4	Silica Gel 60	7.0±0.5	2.5kg
110832-1	Silica Gel 60	7.0±0.5	25kg

Alumina Adsorbents for Preparative Column Chromatography

Catalog No.	Description	pH	Size
1067-3	Aluminum Oxide 60, Basic	9.0±0.5	1kg
1067-6	Aluminum Oxide 60, Basic	9.0±0.5	2kg
1076-3	Aluminum Oxide 90, Basic	9.0±0.5	1kg
1076-6	Aluminum Oxide 90, Basic	9.0±0.5	2kg
1077-2	Aluminum Oxide 90, Neutral	7.3±0.5	1kg
1077-6	Aluminum Oxide 90, Neutral	7.3±0.5	2kg
1077-7	Aluminum Oxide 90, Neutral	7.3±0.5	20kg
1078-3	Aluminum Oxide 90, Acidic	4.0±0.5	1kg
1078-6	Aluminum Oxide 90, Acidic	4.0±0.5	2kg

Spherical Preparative Chromatography - Sorbents

Catalog No.	Description	Particle Size	Size
19654-5	LiChrospher® 60	12µm	100g
19654-7	LiChrospher® 60	12µm	1kg
19655-4	LiChrospher® 60 RPselect B	12µm	100g
19655-5	LiChrospher® 60 RPselect B	12µm	500g
19656-5	LiChrospher® 100 RP18	12µm	100g
19656-4	LiChrospher® 100 RP18	12µm	500g
19662-1	LiChrospher® 300 RP18	12µm	100g
19662-4	LiChrospher® 300 RP18	12µm	500g
11024-5	LiChrospher® 60	15µm	100g
11024-7	LiChrospher® 60	15µm	1kg
11023-5	LiChrospher® 60 RPselect B	15µm	100g
11023-4	LiChrospher® 60 RPselect B	15µm	500g
11022-5	LiChrospher® 100 RP18	15µm	100g
11022-4	LiChrospher® 100 RP18	15µm	500g
19659-1	LiChrospher® 300 RP18	15µm	100g
19659-4	LiChrospher® 300 RP18	15µm	500g

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