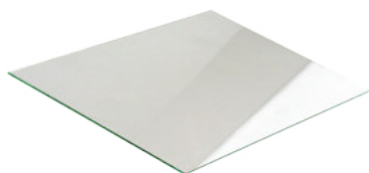




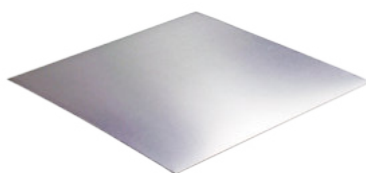


## Contents

|                                             |     |
|---------------------------------------------|-----|
| Basics .....                                | 266 |
| Introductory kits .....                     | 269 |
| Summary of MN ready-to-use layers .....     | 272 |
| Unmodified TLC silica layers .....          | 274 |
| Silica layers with concentrating zone ..... | 278 |
| Unmodified HPTLC silica layers .....        | 280 |
| Modified silica layers .....                | 283 |
| Further layers .....                        | 288 |
| Layers for special TLC separations .....    | 291 |
| Chromatography papers .....                 | 294 |
| Accessories .....                           | 295 |
| Reagents .....                              | 296 |
| Adsorbents .....                            | 297 |



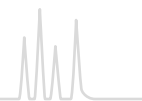
Glass plates



ALUGRAM® Xtra aluminum sheets  
ALUGRAM® aluminum sheets



POLYGRAM® polyester sheets



Thin layer chromatography (TLC) and high performance thin layer chromatography (HPTLC), also called planar chromatography, are, like all chromatographic techniques, based on a multi-stage distribution process involving

- Suitable adsorbents (the stationary phase) coated as a thin layer onto a suitable support (e.g., glass plate, polyester or aluminum sheet; also see page 272)
- Solvents or solvent mixtures (the mobile phase or eluent)
- Sample molecules

The principle of TLC is known for more than 100 years [11]. The real break-through as an analytical method, however, came about 50 years ago as a consequence of the pioneering work of Egon Stahl [12].

Today TLC has gained increasing importance as an analytical separation technique, which is probably due to effects of instrumentation and automation [13]. At the same time the applicability of thin layer chromatography was enhanced by development of new adsorbents and supports.

Today MACHEREY-NAGEL offers a versatile range of ready-to-use layers, which are the result of 50 years of continuous research and development.

## Features of modern TLC / HPTLC

The success of thin layer chromatography as a highly efficient microanalytical separation method is based on a large number of advantageous properties:

- High sample throughput in a short time
- Suitable for screening tests
- Pilot procedure for HPLC and Flash chromatography
- After separation the analytical information can be stored for a longer period of time (the TLC ready-to-use layer acts as storage medium for data)
- Separated substances can be subjected to subsequent analytical procedures (e.g., IR, MS) at a later date
- Rapid and cost-efficient optimization of the separation due to easy change of mobile and stationary phase

## Principle steps of a TLC separation

### Sample preparation

For separation the sample must meet several requirements to obtain good results. Since the TLC plate is a disposable product, sample preparation in general is not as demanding as for other chromatographic methods. However, eventually several steps for sample pretreatment may be necessary. These include sampling, mechanical crushing, extraction steps, filtration and sometimes enrichment of interesting components or clean-up, i.e. removal of undesired impurities.

Our TLC micro-sets introduce some simple methods of sample pretreatment. The dyes or dye mixtures of the beginner's set do not require complicated procedures. The advanced sets require

the user to carry out some additional steps for preparing a sample, thus introducing the user to techniques often performed in industrial laboratories.

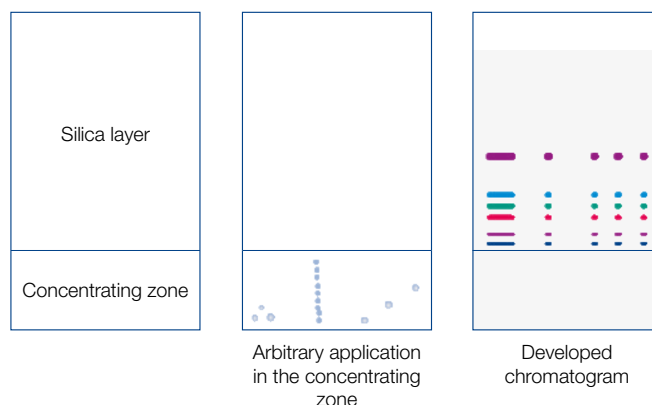
Thorough preparation of samples is an important prerequisite for the success of a TLC separation. For our range of products for more demanding sample pretreatment please see the chapter "SPE" from page 10.

### Sample application

The most frequent technique is application with a glass capillary as spot or short streak.

Application as streak will yield better results especially for instrumental quantification. For both types of application some manual skill is required to obtain reproducible results. Substance zones which are too large from the beginning will cause poor separation since during chromatography they will become even larger and more diffuse.

A valuable aid for manual application especially of large volumes of very dilute samples is the concentrating zone (e.g., SILGUR-25 UV<sub>254</sub>), which consists of a chromatographically inactive adsorbent (Kieselguhr). The substances to be separated are concentrated to a small band in the concentrating zone and the separation starts at the beginning of the chromatographically active adsorbent silica.



Another method for sample concentration is a short pre-elution (few mm) with a solvent, in which all substances have a high  $R_f$  value.

If a quantitative evaluation with a TLC scanner is to follow the separation we recommend to use commercially available sample applicators for spotting. These range from simple spotting guides via nanoapplicators to completely automated spotting devices. Application as streak can be performed automatically by spraying of the sample without touching the layer of the TLC plate. Application as band over the whole width of the TLC plate is especially important for preparative TLC. After application allow the solvent of the samples to evaporate completely (about 10 min) or blow with cold or hot air. Development of a chromatogram should never start before the solvent of the applied samples is evaporated completely.

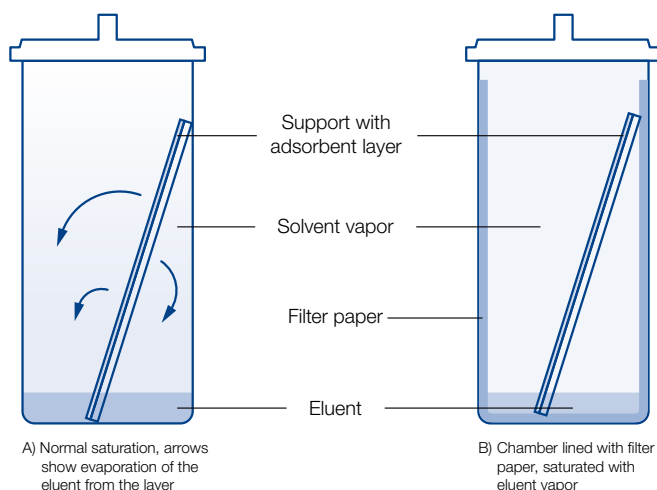


### Developing a chromatogram – separation techniques

The most frequently used separation technique is ascending TLC in a trough chamber (standard method, linear development). Usually it is applied as single development. However, multiple development, with or without change of eluent (step technique) can improve separation results. For 2-dimensional development only 1 spot of the sample is applied in one edge of a plate. After chromatography in the first direction the plate is dried, turned by 90° and developed in the 2<sup>nd</sup> dimension with another eluent. Thus complicated mixtures give 2-dimensional chromatograms taking advantage of the different separating properties of two eluents.

For selection and optimization of the eluent numerous publications are available. A generally applicable standardized optimization method is described by H. Keuker et al. [14].

It is important to pay attention to the atmosphere in the developing chamber. If reproducible migration distances are required, saturation of the chamber atmosphere with eluent vapor is necessary. For this purpose the developing chamber is lined with well absorbing chromatography paper (e.g., MN 260) and charged with a correspondingly larger volume of eluent.



### Evaluation of a thin layer chromatogram

Evaluation depends on the purpose of the chromatographic analysis. For qualitative determination often localization of substances is sufficient. This can be easily achieved by parallel runs with reference substances.

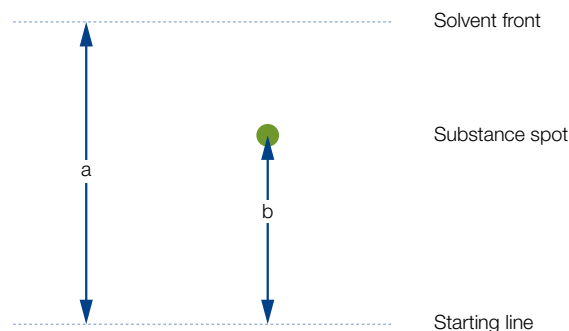
A parameter often used for qualitative evaluation is the  $R_f$  value (retention factor) or the 100-fold value  $hR_f$ . The  $R_f$  value is defined as follows:

$$R_f = \frac{\text{distance starting line – middle of spot}}{\text{distance starting line – solvent front}} = \frac{b}{a}$$

i.e. the  $R_f$  values are between 0 and 1, best between 0.1 and 0.8 (i.e. 10–80 for  $hR_f$ ). If reproducible  $R_f$  values are to be obtained, it is essential that several parameters such as chamber saturation, composition of solvent mixtures, temperature etc. are strictly controlled.

Quantitative evaluation is possible by suitable calibration measurements. For this purpose either the area of a substance spot is measured or a photometric evaluation is performed directly on the layer. The latter procedure, however, requires a higher instrumental expense.

The following paragraphs describe the most frequently used methods for evaluation in TLC.

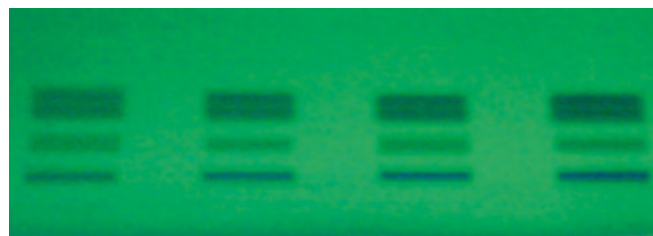


### Qualitative detection

Qualitative evaluation is generally made directly on the TLC plate via characteristic  $R_f$  values of substances, i.e. the ratio of distance start – substance zone to distance start – solvent front and specific chemical reactions.

### Visualization of separated substances

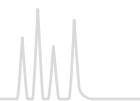
First of all it is necessary to recognize the position of a substance spot. Only in very few cases the sample is a dye which can be seen with the naked eye. Much more often for unspecific visualization substances can be viewed under UV light, since many substances show a UV absorption. If a fluorescent indicator is added to the layer, all substances absorbing in the respective region of wave length cause a quenching of the fluorescence, i.e. they appear as dark spots on the fluorescent layer. Customary fluorescent indicators are excited at 254 nm or (less frequently) at 366 nm with a mercury lamp. For our program of fluorescent indicators for TLC please see page 296.



Quenching of the fluorescence

Identification of separated substances is possible via the  $R_f$  value compared to the pure compound, which is often applied simultaneously on the same plate.

For a number of compounds their native fluorescence can be used for visualization, which is excited by UV light (mostly long-wave UV) (e.g., aflatoxins). This allows not only determination of the  $R_f$  value, but often enables a further qualitative assignment.



If these methods do not allow localization or characterization of a substance, post-chromatographic detection methods can be applied, chemical reactions on the TLC plate [15]. Quite unspecific reactions are iodine adsorption and the charring technique (spraying with sulfuric acid and heat treatment).

More reliable results are possible with specific reagents for spraying or dipping, which form colored or fluorescent compounds with the substances to be detected. Depending on the sensitivity of these reactions they are not only used for group or substance specific characterization (in addition to the  $R_f$  value) but also for quantification down to trace levels. As example take the ninhydrin reaction. Formation of a (usually red) zone with this detection method yields the information, that a certain group of substances, e.g.,  $\alpha$ -amino acids, are present. The  $R_f$  value allows further assignment to one or several single compounds.

For identification of a substance a combination of different detection methods can be useful. Thus almost all lipids can be converted to products with light green fluorescence by reaction with 2',7'-dichlorofluorescein. Adsorption of iodine vapor enables a differentiation between saturated and unsaturated lipids or lipids containing nitrogen. And finally the  $R_f$  value is a third means of identification.

Here are some general remarks concerning spraying: use all spray reagents under a fume hood. The developed, dried TLC plate or sheet is placed on a sheet of filter paper for spraying. Usually it is sufficient to fill the sprayer with about 5–10 mL solution. Spray from a distance of about 15 cm with the aid of a rubber ball or – if available – with pressurized air. It is always better to spray a layer twice very thinly and evenly (with intermediate drying), than to saturate the layer with excessive spray reagent. In the latter case spots tend to become diffuse. After visualization mark outlines of zones with a lead pencil, because some spots tend to fade after a while.

Especially for quantitative evaluation short dipping of the layer in the respective reagent solution is recommended. For this purpose automatic instruments are commercially available, which allow reproducible dipping.

When a substance is localized on the TLC plate (e.g., under UV), but not yet identified, TLC scanners allow recording of UV spectra of individual substance zones directly on the layer, or the zone is removed by scratching or cutting (for sheets), eluted and further analyzed, e.g., by FT-IR, RAMAN, NMR or mass spectroscopy.

### Quantitative evaluation

Often TLC is considered to be only a semiquantitative analytical procedure. This is true for visual evaluation of spots, since the eye can only compare but not measure absolute values. If, however, a direct optical evaluation ("in situ" measurement) is performed on the TLC plate with a thin layer scanner, after measurement of calibration functions, exact quantitative results are possible. Commercial scanners offer many features such as evaluation in absorption and fluorescence, unattended programmed scanning of lanes, multi-wave length measurement, background correction, selectable base line for integration, recording of spectra,

evaluation of circular or anti-circular chromatograms with very high ease of operation. In addition to manual operation control by a computer is possible with respective data collection and storage. Usually wavelengths from 200 to 700 nm are available (visible and UV), e.g., all post-chromatographic (and of course all pre-chromatographic) visualization procedures are evaluated with the proper wavelength, which is determined with the instrument. Time requirements for all these possibilities are extremely low. Interlaboratory experiments with standard deviations of 2 % show how excellent results are obtainable [16].

**TLC micro-sets** introductory kits for science education**Beginner's set**

- Features separations with simple developing solvents; samples are colored thus eliminating the need for visualization.
- All equipment needed is contained in the set.

**Advanced sets F1, F2 and F3**

- Require some experience and skill from the user: some of the samples have to be pretreated before separation, and for identification of substances spray reagents have to be used

**TLC micro-set A for beginners**

This kit contains all chemicals and accessories for the following separations:

- Separation of the fat-soluble (lipophilic)  
Test dye mixture 1: butter yellow, indophenol, sudan blue II, sudan red G
- Separation of a mixture of anthraquinone dyes  
Test dye mixture 2: blue 1, blue 3, green, green blue, red, violet 1, violet 2
- Separation of a mixture of food dyes  
Test dye mixture 3: brilliant black BN (E151), fast red E, erythrosine (E127), yellow orange S (sunset yellow CFC, E110), naphthol red S, ponceau 4 R (E124), tartrazine (E102)
- Separation of dyes from felt tip pens

**Contents of TLC micro-set A for beginners**

1 manual  
3 developing chambers  
50 glass capillaries 1 µL  
1 spotting guide  
2 felt tip pens  
1 measuring cylinder 10 mL  
50 polyester sheets 4 x 8 cm each of POLYGRAM®: SIL G/UV<sub>254</sub>, Alox N/UV<sub>254</sub> and CEL 300  
8 mL each of test dye mixture 1 (4 lipophilic dyes), test dyes sudan red G, and sudan blue II  
8 mL each of test dye mixture 2 (7 anthraquinone dyes), test dyes blue 1 and violet 2  
8 mL each of test dye mixture 3 (7 food dyes), test dyes yellow orange S, and brilliant black BN  
100 mL each of toluene, toluene – cyclohexane (2:1, v/v), ethanol, 2.5 % sodium citrate solution, 25 % ammonia solution – 2-propanol (5:3, v/v)

**Ordering information**

| Designation                                                                                                      | Pack of  | REF    |
|------------------------------------------------------------------------------------------------------------------|----------|--------|
| <b>TLC micro-set A for beginners*</b>                                                                            | 1 kit    | 814000 |
| Replacement parts for TLC micro-set A                                                                            |          |        |
| Test dye mixture 1*, solution of 4 lipophilic dyes in toluene (components see above)                             | 8 mL     | 814001 |
| Test dye mixture 2*, solution of 7 anthraquinone dyes in toluene – cyclohexane (2:1, v/v) (components see above) | 8 mL     | 814002 |
| Test dye mixture 3, aqueous solution of 7 food dyes (components see above)                                       | 8 mL     | 814003 |
| Collection of 4 individual components of test dye mixture 1*                                                     | 4 x 8 mL | 814011 |
| Collection of 7 individual components of test dye mixture 2*                                                     | 7 x 8 mL | 814012 |
| Collection of 7 individual components of test dye mixture 3                                                      | 7 x 8 mL | 814013 |
| Sodium citrate, 2.5 g in 100 mL bottle to fill up with distilled water                                           | 2.5 g    | 814029 |

\* These products contain harmful substances which must be specially labeled as hazardous. For detailed information please see SDS.

Information about the advanced sets F1, F2 and F3 can be found on page 270 and page 271.



## TLC micro-set F1

This kit contains all chemicals required for the separation of

- Amino acids (test mixture, consisting of alanine, arginine, tryptophan and valine)
- Amino acids in urine
- The heavy metal cations copper(II) and manganese(II)

## Contents of TLC micro-set F1

1 manual, 50 glass capillaries 1  $\mu$ L  
50 polyester sheets 4 x 8 cm each of POLYGRAM®:  
SIL G/UV<sub>254</sub> and CEL 300  
100 mL each of *n*-butanol, ninhydrin spray reagent (0.2 % in ethanol), acetone, 25 % ammonia solution, rubeanic acid spray reagent  
50 mL each of 50 % acetic acid, 18 % hydrochloric acid  
8 mL each of the amino acid test mixture (see left), tryptophan and arginine reference solutions  
8 mL each of the heavy metal cation test mixture (see left), Cu<sup>2+</sup> and Mn<sup>2+</sup> reference solutions

## TLC micro-set F2

This kit contains all chemicals required

- For analysis of edible fats
- For analysis of fats and cholesterol in blood

## Contents of TLC micro-set F2

1 manual, 50 glass capillaries 1  $\mu$ L  
50 polyester sheets 4 x 8 cm POLYGRAM®:  
SIL G/UV<sub>254</sub>  
5 disposable pipettes 25  $\mu$ L  
5 sample vials N 11 (1.5 mL) with PE caps and seals  
3 sample vials 30 mL (for butter, margarine and edible oil)  
100 mL each of cyclohexane and molybdatophosphoric acid spray reagent  
2 x 50 mL acetone with calibrated pipette  
25 mL butan-2-one  
8 mL cholesterol reference solution

## TLC micro-set F3

This kit contains all chemicals required

- For separation of analgetics (pain relievers)
- For drug analysis as shown for cinchona bark

## Contents of TLC micro-set F3

1 manual, 50 glass capillaries 1  $\mu$ L  
50 polyester sheets 4 x 8 cm POLYGRAM®:  
SIL G/UV<sub>254</sub>  
5 Aspirin® tablets, 5 Thomapyrin® tablets  
20 folded filters MN 615 1/4, 11 cm diameter  
3 sample vials 8 mL (for Aspirin® sample, Thomapyrin® sample, cinchona bark extract), 5 g cinchona bark  
100 mL each of ethanol, 2-propanol, toluene – diethyl ether  
je 100 mL Ethanol, 2-Propanol, Toluol – Diethylether (61:39, v/v), spray reagent for caffeine and spray reagent according to Dragendorff-Munier  
50 mL each of iron(III) chloride solution and potassium hexacyanoferrate(III) solution, 30 mL ethyl acetate  
25 mL each of 12.5 % ammonia solution and diethylamine  
8 mL each of caffeine, paracetamol, quinine reference solutions

All experiments with TLC micro-sets F1–F3 require the materials kit (see TLC micro-set M on page 271).



## Ordering information

| Designation                                                                                                           | Pack of  | REF    |
|-----------------------------------------------------------------------------------------------------------------------|----------|--------|
| <b>TLC micro-set F1*</b>                                                                                              | 1 kit    | 814200 |
| Refill reagents for TLC micro-set F1                                                                                  |          |        |
| Amino acid test mixtures (components see previous page)                                                               | 8 mL     | 814201 |
| Collection of 4 individual components of the amino acid test mixture                                                  | 4 x 8 mL | 814202 |
| Cation test mixture (components see previous page)                                                                    | 8 mL     | 814204 |
| Collection of 2 individual components of the cation test mixture ( $\text{Cu}^{2+}$ , $\text{Mn}^{2+}$ )              | 2 x 8 mL | 814205 |
| <b>TLC micro-set F2*</b>                                                                                              | 1 kit    | 814300 |
| Refill reagents for TLC micro-set F2                                                                                  |          |        |
| Cholesterol reference solution*                                                                                       | 8 mL     | 814301 |
| <b>TLC micro-set F3*</b>                                                                                              | 1 kit    | 814400 |
| Refill reagents for TLC micro-set F3                                                                                  |          |        |
| Quinine reference solution*                                                                                           | 8 mL     | 814405 |
| Paracetamol reference solution*                                                                                       | 8 mL     | 814406 |
| Caffeine reference solution*                                                                                          | 8 mL     | 814407 |
| <b>Refill packs TLC sheets for all TLC micro-sets</b>                                                                 |          |        |
| TLC polyester sheets POLYGRAM® SIL G/UV <sub>254</sub> , 4 x 8 cm                                                     | 4 x 50   | 814025 |
| TLC polyester sheets POLYGRAM® Alox N/UV <sub>254</sub> , 4 x 8 cm                                                    | 4 x 50   | 814026 |
| TLC polyester sheets POLYGRAM® CEL 300, 4 x 8 cm                                                                      | 4 x 50   | 814027 |
| TLC polyester sheets POLYGRAM® 4 x 8 cm: 100 x SIL G/UV <sub>254</sub> ; 50 x Alox N/UV <sub>254</sub> ; 50 x CEL 300 | 1 kit    | 814028 |

\* These products contain harmful substances which must be specially labeled as hazardous. For detailed information please see SDS.

Accessories for TLC micro-sets can be found under TLC accessories on page 295.

Spray reagents can be found on page 296.



## TLC micro-set M

This kit is prerequisite for the separations with kits F1 to F3. In addition, it serves as basic equipment for the individual study of further thin layer chromatographic experiments.

## Contents of TLC micro-set M (materials kit)

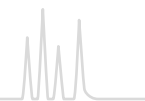
2 x 50 glass capillaries 1  $\mu\text{L}$ , 2 spotting guides  
1 rubber cap for capillaries  
1 measuring cylinder 10 mL  
1 beaker 25 mL  
2 developing chambers  
1 glass laboratory sprayer with rubber bulb  
1 plastic syringe 1 mL  
20 sheets filter paper MN 713 (15 x 21 cm)  
50 polyester sheets 4 x 8 cm each of POLYGRAM®:  
SIL G/UV<sub>254</sub>, Alox N/UV<sub>254</sub> and CEL 300

## Ordering information

| Designation                            | Pack of | REF    |
|----------------------------------------|---------|--------|
| <b>TLC micro-set M (materials kit)</b> | 1 kit   | 814100 |



# Summary of MN ready-to-use layers



## Advantages of MN plates and sheets for TLC

### Continuous high quality

- Guaranteed by stringent production control including standardized lot tests, surface checks for roughness or cracks as well as hardness and adherence checks

### Comprehensive range of phases for TLC / HPTLC

- There is no universal TLC plate which meets all possible types of analyses
- Our versatile range of TLC ready-to-use layers covers many different types of applications

### Immediately ready for chromatographic separation

- Coatings or impregnations are not necessary

### Homogeneous, smooth, well adhering layers

- An important criterion especially for reproducible quantitative evaluation



Electron microscope photograph of a cross section through a glass plate with silica layer (magnification x 500)

## Adsorbents for MN plates and sheets for TLC

### Classical adsorbents

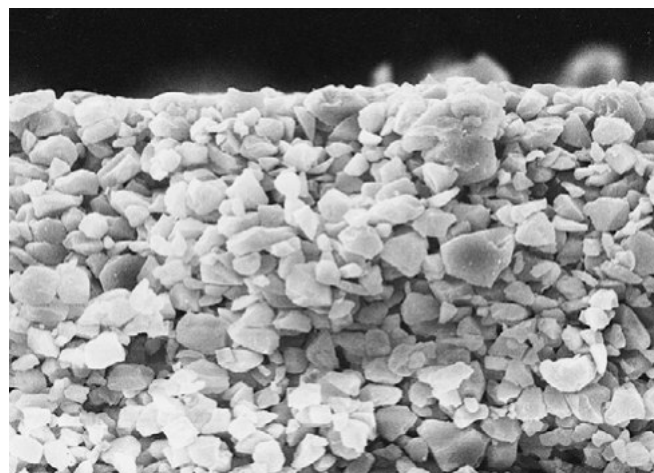
- For ~ 80 % of all TLC separations silica 60 (mean pore diameter 60 Å = 6 nm) is used
- Other classical adsorbents are aluminum oxide, cellulose, kieselguhr, ion exchangers and polyamide

### Special phases

- Modified silica, like C<sub>18</sub> (octadecyl-) cyano-, amino-, diol-, RP-2
- Special layers for specific separations, like PAH- or enantiomer separation

### Particle size distribution and thickness of layer

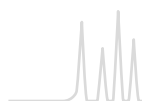
- Are chosen to fit the given type of application (e.g., HPTLC, standard or preparative separations)
- Most MN ready-to-use layers are available with or without fluorescent indicator



Electron microscope photograph of a cross section through an aluminum sheet with silica layer (magnification x 500)

## Supports for ready-to-use layers for TLC

|                                                      | Glass plates <sup>G</sup> | POLYGRAM® <sup>P</sup> | ALUGRAM® <sup>A</sup> / ALUGRAM® Xtra <sup>Ax</sup>            |
|------------------------------------------------------|---------------------------|------------------------|----------------------------------------------------------------|
| Physical properties of support materials             |                           |                        |                                                                |
| Material                                             | glass                     | polyester              | aluminum                                                       |
| Thickness (approx.)                                  | 1.3 mm                    | 0.2 mm                 | 0.15 mm                                                        |
| Weight, packaging and storage requirements           | high                      | low                    | low                                                            |
| Torsional strength                                   | ideal                     | low                    | relatively high                                                |
| Temperature stability                                | high                      | max. 185 °C            | high                                                           |
| Susceptible to breakage                              | yes                       | no                     | no                                                             |
| Can be cut with scissors                             | no                        | yes                    | yes                                                            |
| Chemical resistance of support materials             |                           |                        |                                                                |
| Against solvents                                     | high                      | high                   | high                                                           |
| Against mineral acids and conc. ammonia              | high                      | high                   | low                                                            |
| Stability of the binder system of NP plates in water |                           |                        |                                                                |
| Suitability for aqueous detection reagents           | depending on phase        | very suitable          | ALUGRAM®: limited suitability;<br>ALUGRAM® Xtra: very suitable |



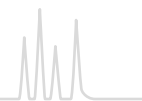
# Summary of MN ready-to-use layers



| Summary                                                                                                                    |          |   |   |                                                                         |                                                                                                   |     |
|----------------------------------------------------------------------------------------------------------------------------|----------|---|---|-------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----|
| Phase                                                                                                                      | Support* |   |   | Layer                                                                   | Page                                                                                              |     |
| Standard silica particle size 5–17 µm                                                                                      |          |   |   |                                                                         |                                                                                                   |     |
| ADAMANT                                                                                                                    | G        |   |   | silica 60, improved binder system, optimized particle size distribution | 274                                                                                               |     |
| SIL G                                                                                                                      | G        | P | A | Ax                                                                      | silica 60, standard grade                                                                         | 276 |
| DURASIL                                                                                                                    | G        |   |   |                                                                         | silica 60, special binder system                                                                  | 277 |
| SILGUR                                                                                                                     | G        |   |   | Ax                                                                      | silica 60 with kieselguhr concentrating zone                                                      | 279 |
| Unmodified silica for HPTLC particle size 2–10 µm                                                                          |          |   |   |                                                                         |                                                                                                   |     |
| Nano-SILGUR                                                                                                                | G        |   |   | Ax                                                                      | nano silica 60 with kieselguhr concentrating zone                                                 | 279 |
| Nano-ADAMANT                                                                                                               | G        |   |   |                                                                         | nano silica 60, improved binder system, optimized particle size distribution                      | 281 |
| Nano-SIL                                                                                                                   | G        |   | A | Ax                                                                      | nano silica 60, standard grade                                                                    | 281 |
| Nano-DURASIL                                                                                                               | G        |   |   |                                                                         | nano silica 60, special binder system                                                             | 282 |
| Modified silica for HPTLC particle size 2–10 µm                                                                            |          |   |   |                                                                         |                                                                                                   |     |
| Nano-SIL C18-50 /<br>Nano-SIL C18-100                                                                                      | G        |   |   |                                                                         | nano silica with partial or complete C <sub>18</sub> modification                                 | 283 |
| RP-18 W/UV <sub>254</sub>                                                                                                  | G        |   | A |                                                                         | nano silica with partial octadecyl modification, wettable with water                              | 284 |
| RP-2/UV <sub>254</sub>                                                                                                     | G        |   | A |                                                                         | silanized silica = dimethyl-modified nano silica 60                                               | 284 |
| Nano-SIL CN                                                                                                                | G        |   | A |                                                                         | cyano-modified nano silica                                                                        | 285 |
| Nano-SIL NH <sub>2</sub>                                                                                                   | G        |   | A |                                                                         | amino-modified nano silica                                                                        | 286 |
| Nano-SIL DIOL                                                                                                              | G        |   |   |                                                                         | diol-modified nano silica                                                                         | 287 |
| Aluminum oxide                                                                                                             |          |   |   |                                                                         |                                                                                                   |     |
| Alox-25 / Alox N                                                                                                           | G        | P | A |                                                                         | aluminum oxide                                                                                    | 288 |
| Cellulose, unmodified and modified                                                                                         |          |   |   |                                                                         |                                                                                                   |     |
| CEL 300                                                                                                                    | G        | P | A |                                                                         | native fibrous cellulose MN 300                                                                   | 289 |
| CEL 400                                                                                                                    | G        | P |   |                                                                         | microcrystalline cellulose MN 400 (AVICEL®)                                                       | 289 |
| CEL 300 PEI                                                                                                                |          | P |   |                                                                         | polyethyleneimine-impregnated cellulose ion exchanger                                             | 290 |
| CEL 300 AC                                                                                                                 |          | P |   |                                                                         | acetylated cellulose MN 300                                                                       | 290 |
| POLYAMID-6                                                                                                                 |          |   |   |                                                                         |                                                                                                   |     |
| POLYAMID-6                                                                                                                 |          | P |   |                                                                         | perlon = ε-polycaprolactame                                                                       | 290 |
| Layers for special separations                                                                                             |          |   |   |                                                                         |                                                                                                   |     |
| CHIRALPLATE                                                                                                                | G        |   |   |                                                                         | RP silica with Cu <sup>2+</sup> ions and chiral reagent, for enantiomer separation of amino acids | 291 |
| SIL N-HR                                                                                                                   |          | P |   |                                                                         | high purity silica 60, special binder system, higher gypsum content                               | 291 |
| SIL G-25 HR                                                                                                                | G        |   |   |                                                                         | high purity silica 60 with gypsum, recommended for aflatoxin analysis                             | 292 |
| SIL G-25 Tenside                                                                                                           | G        |   |   |                                                                         | silica G with ammonium sulfate for separation of surfactants                                      | 292 |
| Nano-SIL PAH                                                                                                               | G        |   |   |                                                                         | nano silica with special impregnation for PAH analysis                                            | 292 |
| IONEX-25 SA-Na                                                                                                             |          | P |   |                                                                         | mixed layer of strongly acidic cation exchanger and silica                                        | 293 |
| IONEX-25 SB-AC                                                                                                             |          | P |   |                                                                         | mixed layer of strongly basic anion exchanger and silica                                          | 293 |
| Alox / CEL-AC-Mix                                                                                                          | G        |   |   |                                                                         | mixed layer of aluminum oxide and acetylated cellulose                                            | 293 |
| SILCEL-Mix                                                                                                                 | G        |   |   |                                                                         | mixed layer of cellulose and silica                                                               | 293 |
| * G = Glass plates    P = POLYGRAM® polyester sheets    A = ALUGRAM® aluminum sheets    Ax = ALUGRAM® Xtra aluminum sheets |          |   |   |                                                                         |                                                                                                   |     |



# Unmodified TLC silica layers



## ADAMANT <sup>G</sup> unmodified standard silica layers

### ★ Key features

- Outstanding hardness and abrasion resistance due to an optimized binder system
- Increased separation efficiency due to an optimized particle size distribution
- High suitability for trace analysis resulting from a UV indicator with increased brilliance and a lownoise background of the layer

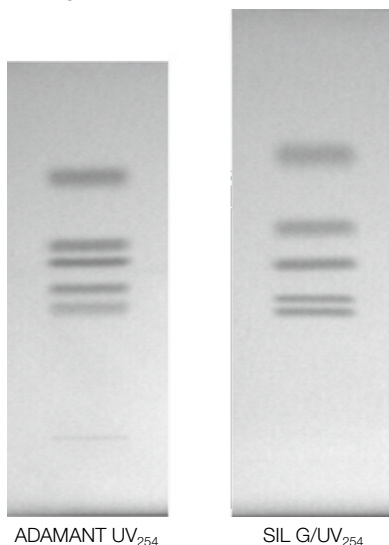
### 🔧 Technical characteristics

- Silica 60, mean pore size 60 Å, specific surface (BET) ~ 500 m<sup>2</sup>/g, specific pore volume 0.75 mL/g, particle size 5–17 µm

#### Separation of steroids

MN Appl. No. 402930

Layers: ADAMANT UV<sub>254</sub>, SIL G/UV<sub>254</sub>  
 Sample: 0.1 % solution in CHCl<sub>3</sub>  
 Eluent: chloroform – methanol (97:3, v/v)  
 Migration distance: ADAMANT 50 mm in 10 min, SIL G 57 mm in 10 min  
 Detection: UV



| Substance           | R <sub>f</sub> ADAMANT | R <sub>f</sub> SIL G |
|---------------------|------------------------|----------------------|
| Cortisone           | 0.37                   | 0.27                 |
| Corticosterone      | 0.43                   | 0.30                 |
| Testosterone        | 0.50                   | 0.39                 |
| Deoxycorticosterone | 0.55                   | 0.46                 |
| Progesterone        | 0.73                   | 0.62                 |

#### Separation of barbiturates

MN Appl. No. 402950

Layer: ADAMANT UV<sub>254</sub>  
 Sample volume: 1 µL  
 Eluent: chloroform – acetone (95:5, v/v)  
 Migration distance: 70 mm in 20 min  
 Detection: UV



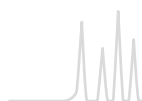
| Substance             | R <sub>f</sub> |
|-----------------------|----------------|
| Thiamylal (0.5 %)     | 0.69           |
| Thiopental (1.0 %)    | 0.65           |
| Hexobarbital (5.0 %)  | 0.41           |
| Pentobarbital (1.0 %) | 0.26           |
| Phenobarbital (1.0 %) | 0.18           |

### Ordering information

| Plate size [cm]  | 2.5 x 7.5 | 5 x 10 | 5 x 10 | 5 x 20 | 10 x 10 | 10 x 20 | 20 x 20 | Thickness of layer | Fluorescent indicator |
|------------------|-----------|--------|--------|--------|---------|---------|---------|--------------------|-----------------------|
| Pack of [plates] | 100       | 50     | 200    | 100    | 25      | 50      | 25      |                    |                       |

### Glass plates

|                           |        |            |            |        |         |        |        |         |                   |
|---------------------------|--------|------------|------------|--------|---------|--------|--------|---------|-------------------|
| ADAMANT                   | 821040 | 821040.200 | 821050     | 821060 | 0.25 mm | —      |        |         |                   |
| ADAMANT UV <sub>254</sub> | 821005 | 821010     | 821010.200 | 821015 | 821020  | 821025 | 821030 | 0.25 mm | UV <sub>254</sub> |



# Unmodified TLC silica layers



## ALUGRAM® Xtra SIL G Ax unmodified standard silica layers on aluminum

### ★ Key features

- Outstanding wettability for precise colorization results, even with 100 % aqueous detection reagents
- Excellent separation efficiency and reproducibility from lot to lot
- Easy and reliable cutting due to an optimized binder system, no flaking of silica

### 🔧 Technical characteristics

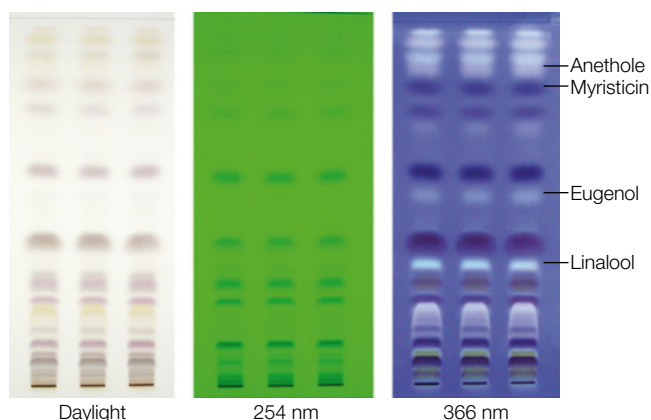
- Silica 60, mean pore size 60 Å, specific surface (BET) ~ 500 m<sup>2</sup>/g, specific pore volume 0.75 mL/g, particle size 5–17 µm
- Binder: highly polymeric product, which is stable in almost all organic solvents and resistant towards aggressive visualization reagents, also completely stable in purely aqueous eluents

### Separation of nutmeg ingredients

MN Appl. No. 403590

Layer: ALUGRAM® Xtra SIL G UV<sub>254</sub>  
 Sample: shake 1.0 g freshly powdered drug for 3 min with 4 mL methanol and filter; apply 10 µL  
 Eluent: toluene – ethyl acetate (95:5, v/v)  
 Migration distance: 15 cm  
 Detection: 254 nm: underivatized  
 daylight and 366 nm: spray with 5 % ethanolic sulfuric acid, 1 % vanillic acid and heat to 105 °C

The chromatograms show the following zones with increasing  $R_f$  values: linalool (bluish grey), eugenol (yellowish brown), myristicin (reddish brown), and anethole (pink-violet). Other colored zones may appear.



### Ordering information

| Plate size [cm]  | 2.5 x 7.5 | 4 x 8 | 5 x 7.5 | 5 x 10 | 5 x 20 | 10 x 20 | 20 x 20 | Thickness of layer | Fluorescent indicator |
|------------------|-----------|-------|---------|--------|--------|---------|---------|--------------------|-----------------------|
| Pack of [plates] | 200       | 50    | 20      | 50     | 50     | 20      | 25      |                    |                       |

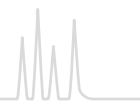
### ALUGRAM® Xtra aluminum sheets

|                         |        |        |           |        |        |        |        |         |                   |
|-------------------------|--------|--------|-----------|--------|--------|--------|--------|---------|-------------------|
| SIL G                   |        |        | 818230.20 | 818261 | 818232 |        | 818233 | 0.20 mm | –                 |
| SIL G/UV <sub>254</sub> | 818329 | 818331 | 818330.20 | 818360 | 818332 | 818362 | 818333 | 0.20 mm | UV <sub>254</sub> |

Further application examples can be found online in our application database at [www.mn-net.com/apps](http://www.mn-net.com/apps)



# Unmodified TLC silica layers



## SIL G G P A unmodified standard silica layers

### Technical characteristics

- Silica 60, mean pore size 60 Å, specific surface (BET) ~ 500 m<sup>2</sup>/g, specific pore volume 0.75 mL/g, particle size 5–17 µm
- Thickness of layer for analytical plates 0.25 mm, for preparative plates 0.5 and 1 mm; for 2 mm preparative layers a slightly coarser material is used
- Indicators: manganese activated zinc silicate with green fluorescence for short-wave UV (254 nm); special inorganic fluorescent pigment with blue fluorescence for long-wave UV (366 nm)
- Binders: highly polymeric products, which are stable in almost all organic solvents and resistant towards aggressive visualization reagents; binder system for POLYGRAM® sheets is also completely stable in purely aqueous eluents

### Ordering information

#### Glass plates

| Plate size [cm]                | 2.5 x 7.5  | 5 x 10 | 5 x 10     | 5 x 20 | 10 x 10 | 10 x 20 | 20 x 20 | Thickness of layer |
|--------------------------------|------------|--------|------------|--------|---------|---------|---------|--------------------|
| Pack of [plates]               | 100        | 50     | 200        | 100    | 25      | 50      | 25      |                    |
| SIL G-25                       |            | 809017 | 809017.200 | 809011 |         | 809012  | 809013  | 0.25 mm            |
| SIL G-25 UV <sub>254</sub>     | 809028.100 | 809027 | 809027.200 | 809021 | 809020  | 809022  | 809023  | 0.25 mm            |
| SIL G-25 UV <sub>254+366</sub> |            |        |            | 809121 |         | 809122  | 809123  | 0.25 mm            |

#### Glass plates

| Pack of [plates]           | (preparative TLC) | 20     |         |
|----------------------------|-------------------|--------|---------|
| SIL G-50                   |                   | 809051 | 0.50 mm |
| SIL G-50 UV <sub>254</sub> |                   | 809053 | 0.50 mm |

#### Glass plates

| Pack of [plates]            | (preparative TLC) | 15     |         |
|-----------------------------|-------------------|--------|---------|
| SIL G-100                   |                   | 809061 | 1.00 mm |
| SIL G-100 UV <sub>254</sub> |                   | 809063 | 1.00 mm |

#### Glass plates

| Pack of [plates]            | (preparative TLC) | 12     |         |
|-----------------------------|-------------------|--------|---------|
| SIL G-200                   |                   | 809073 | 2.00 mm |
| SIL G-200 UV <sub>254</sub> |                   | 809083 | 2.00 mm |

#### POLYGRAM® polyester sheets

| Plate size [cm]         | 2.5 x 7.5 | 4 x 8  | 5 x 20 | 20 x 20                 | 40 x 20 |         |
|-------------------------|-----------|--------|--------|-------------------------|---------|---------|
| Pack of [plates]        | 200       | 50     | 50     | 25                      | 25      |         |
| SIL G                   | 805902    | 805032 | 805012 | 805013                  | 805014  | 0.20 mm |
| SIL G/UV <sub>254</sub> | 805901    | 805021 | 805022 | 805023                  | 805024  | 0.20 mm |
| SIL G/UV <sub>254</sub> |           |        |        | roll 500 x 20 cm 805017 |         | 0.20 mm |

#### ALUGRAM® aluminum sheets

| Plate size [cm]         | 2.5 x 7.5 | 4 x 8  | 5 x 7.5   | 5 x 10 | 5 x 20 | 10 x 20 | 20 x 20 |         |
|-------------------------|-----------|--------|-----------|--------|--------|---------|---------|---------|
| Pack of [plates]        | 200       | 50     | 20        | 50     | 50     | 20      | 25      |         |
| SIL G                   |           |        | 818030.20 | 818161 | 818032 | 818163  | 818033  | 0.20 mm |
| SIL G/UV <sub>254</sub> | 818129    | 818131 | 818130.20 | 818160 | 818132 | 818162  | 818133  | 0.20 mm |

Further application examples can be found online in our application database at [www.mn-net.com/apps](http://www.mn-net.com/apps)



## DURASIL unmodified standard silica layers

### Technical characteristics

- Silica 60, mean pore size 60 Å, specific surface (BET) ~ 500 m<sup>2</sup>/g, specific pore volume 0.75 mL/g, particle size 5–17 µm
- Hard, water-resistant and wettable layers due to a special binder system

### Ordering information

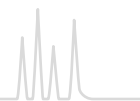
| Plate size [cm]  | 5 x 10 | 5 x 10 | 5 x 20 | 10 x 20 | 20 x 20 | Thickness of layer | Fluorescent indicator |
|------------------|--------|--------|--------|---------|---------|--------------------|-----------------------|
| Pack of [plates] | 50     | 200    | 100    | 50      | 25      |                    |                       |

### Glass plates

|                              |        |            |        |        |        |         |                   |
|------------------------------|--------|------------|--------|--------|--------|---------|-------------------|
| DURASIL-25                   |        |            |        | 812003 | 812004 | 0.25 mm | –                 |
| DURASIL-25 UV <sub>254</sub> | 812005 | 812005.200 | 812006 | 812007 | 812008 | 0.25 mm | UV <sub>254</sub> |



The most TLC layers are available as glass plate, polyester- or aluminum sheet (also see page 272 and 273).

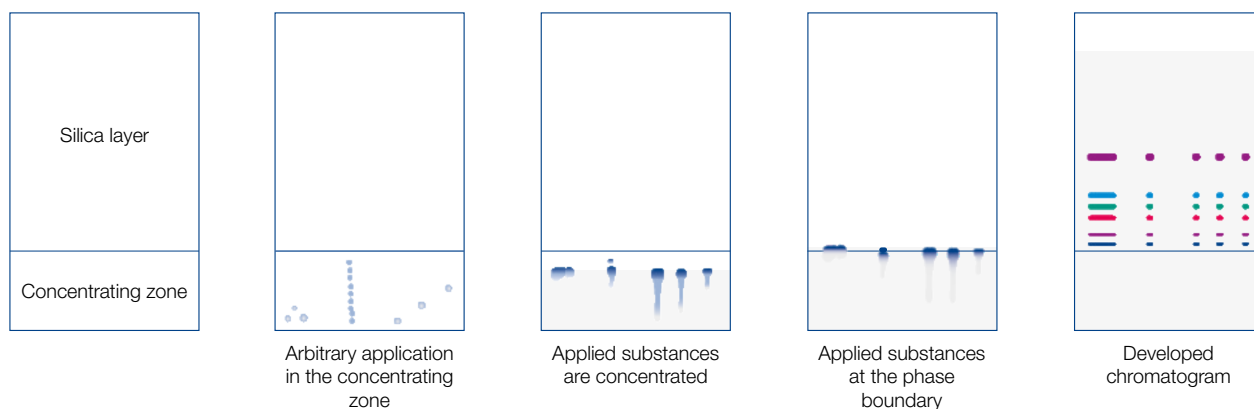


## MN TLC pre-coated layers

– qualitative and individual tailored

### Kieselguhr zone

- For rapid sample application
- Because kieselguhr is completely inert towards a large number of compounds, the samples always form a narrow band at the interface of the two adsorbents, irrespective of shape, size or position of the spots in the concentrating zone. Separation then takes place in the silica layer.





## Silica layers with concentrating zone



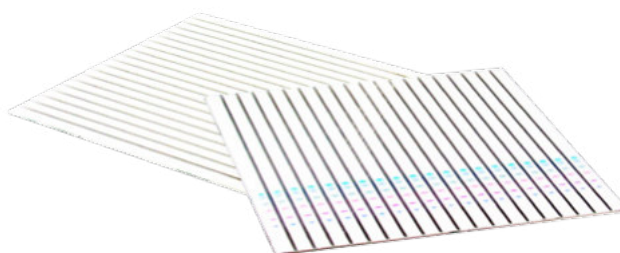
### SILGUR G Ax unmodified standard silica layers with concentrating zone

#### Technical characteristics

- Silica 60, mean pore size 60 Å, specific surface (BET) ~ 500 m<sup>2</sup>/g, specific pore volume 0.75 mL/g, particle size 5–17 µm
- Kieselguhr zone for rapid sample application (see page 278)
- Channel-plate with 19 channels help to prevent cross contamination by separating several samples
- More samples can be separated on a plate, and spot areas can be more easily determined

#### Ordering information

| Plate size [cm]                      | 10 x 20 | 20 x 20 | Thickness of layer | Fluorescent indicator |
|--------------------------------------|---------|---------|--------------------|-----------------------|
| <b>Glass plates</b>                  |         |         |                    |                       |
| Pack of [plates]                     | 50      | 25      |                    |                       |
| SILGUR-25                            | 810012  | 810013  | 0.25 mm            | –                     |
| SILGUR-25 UV <sub>254</sub>          | 810022  | 810023  | 0.25 mm            | UV <sub>254</sub>     |
| <b>Channel-Plates</b>                |         |         |                    |                       |
| Pack of [plates]                     |         | 25      |                    |                       |
| SILGUR-25-C UV <sub>254</sub>        |         | 810123  | 0.25 mm            | UV <sub>254</sub>     |
| <b>ALUGRAM® Xtra aluminum sheets</b> |         |         |                    |                       |
| Pack of [plates]                     | 20      | 25      |                    |                       |
| SILGUR                               | 818412  | 818413  | 0.20 mm            | –                     |
| SILGUR UV <sub>254</sub>             | 818422  | 818423  | 0.20 mm            | UV <sub>254</sub>     |



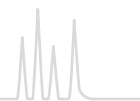
### Nano-SILGUR G Ax unmodified HPTLC silica layers with concentrating zone

#### Technical characteristics

- Nano silica 60, pore size 60 Å, specific surface (BET) ~ 500 m<sup>2</sup>/g, mean specific pore volume 0.75 mL/g, particle size 2–10 µm
- Kieselguhr zone for rapid sample application (see page 278)

#### Ordering information

| Plate size [cm]                      | 10 x 10 | Thickness of layer | Fluorescent indicator |
|--------------------------------------|---------|--------------------|-----------------------|
| Pack of [plates]                     | 25      |                    |                       |
| <b>Glass plates</b>                  |         |                    |                       |
| Nano-SILGUR-20                       | 811032  | 0.20 mm            | –                     |
| Nano-SILGUR-20 UV <sub>254</sub>     | 811042  | 0.20 mm            | UV <sub>254</sub>     |
| <b>ALUGRAM® Xtra aluminum sheets</b> |         |                    |                       |
| Nano-SILGUR                          | 818432  | 0.20 mm            | –                     |
| Nano-SILGUR UV <sub>254</sub>        | 818442  | 0.20 mm            | UV <sub>254</sub>     |



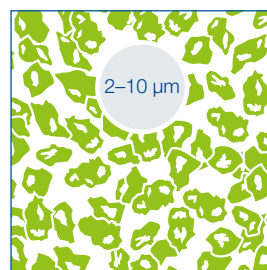
## Sharper separation by nano silica

### Nano silica for HPTLC

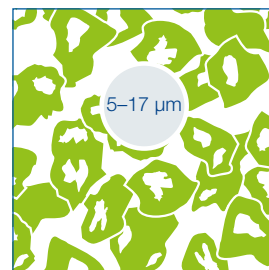
- Narrow fractionation of the silica particles allows theoretical plate heights, which are one order of magnitude smaller than on standard silica layers.

### Advantages

- Shorter migration distances
- Lower amount of samples required
- Increased detection sensitivity with equal selectivity
- Less developing time



Nano silica

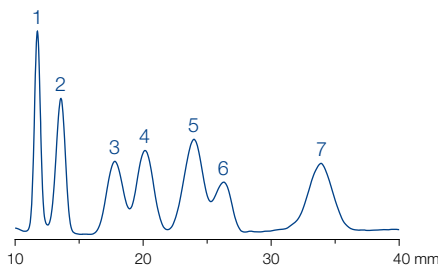
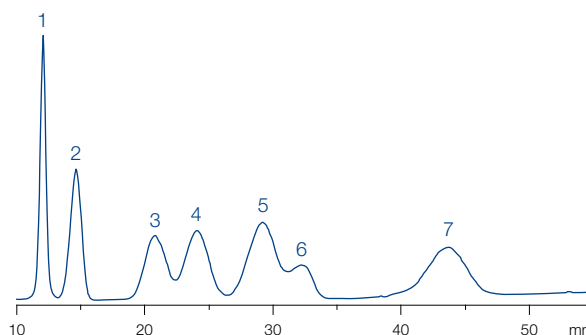


Standard silica

### Comparison of ADAMANT and Nano-ADAMANT plates for separation of anthraquinone dyes

Layers: A) ADAMANT  
B) Nano-ADAMANT  
Sample: 1  $\mu$ L, about 0.1 %  
Eluent: toluene – cyclohexane (4:3, v/v)  
Migration time: A) 30 min, B) 15 min

Peaks:  
1. Blue 3  
2. Violet 2  
3. Red  
4. Green  
5. Blue 1  
6. Greenish blue  
7. Violet 1





## Nano-ADAMANT <sup>G</sup> unmodified HPTLC silica layers

### ★ Key features

- Outstanding hardness and abrasion resistance due to an optimized binder system
- Increased separation efficiency due to an optimized particle size distribution
- High suitability for trace analyses resulting from a UV indicator with increased brilliance and a lownoise background of the layer

### 🔧 Technical characteristics

- Nano silica 60, mean pore size 60 Å, specific surface (BET) ~ 500 m<sup>2</sup>/g, specific pore volume 0.75 mL/g, particle size 2–10 µm

### Ordering information

| Plate size [cm]                | 10 x 10 | 10 x 20 | Thickness of layer | Fluorescent indicator |
|--------------------------------|---------|---------|--------------------|-----------------------|
| Pack of [plates]               | 25      | 50      |                    |                       |
| Glass plates                   |         |         |                    |                       |
| Nano-ADAMANT                   | 821140  | 821150  | 0.20 mm            | –                     |
| Nano-ADAMANT UV <sub>254</sub> | 821110  | 821120  | 0.20 mm            | UV <sub>254</sub>     |

## Nano-SIL <sup>G Ax A</sup> unmodified HPTLC silica layers

### 🔧 Technical characteristics

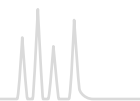
- Nano silica 60, mean pore size 60 Å, specific surface (BET) ~ 500 m<sup>2</sup>/g, specific pore volume 0.75 mL/g, particle size 2–10 µm
- Indicator: manganese activated zinc silicate with green fluorescence for short-wave UV (254 nm)
- Binder: highly polymeric product, which is stable in almost all organic solvents and resistant towards aggressive visualization reagents

### Ordering information

| Plate size [cm]               | 5 x 5  | 5 x 20 | 10 x 10 | 10 x 20 | 20 x 20 | Thickness of layer | Fluorescent indicator |
|-------------------------------|--------|--------|---------|---------|---------|--------------------|-----------------------|
| Pack of [plates]              | 100    | 50     | 25      | 50      | 25      |                    |                       |
| Glass plates                  |        |        |         |         |         |                    |                       |
| Nano-SIL-20                   | 811011 |        | 811012  | 811013  |         | 0.20 mm            | –                     |
| Nano-SIL-20 UV <sub>254</sub> | 811021 |        | 811022  | 811023  |         | 0.20 mm            | UV <sub>254</sub>     |
| ALUGRAM® Xtra aluminum sheets |        |        |         |         |         |                    |                       |
| Nano-SIL G                    |        | 818240 |         |         | 818241  | 0.20 mm            | –                     |
| Nano-SIL G/UV <sub>254</sub>  |        | 818342 |         |         | 818343  | 0.20 mm            | UV <sub>254</sub>     |
| ALUGRAM® aluminum sheets      |        |        |         |         |         |                    |                       |
| Nano-SIL G                    |        |        |         |         | 818141  | 0.20 mm            | –                     |
| Nano-SIL G/UV <sub>254</sub>  |        |        |         |         | 818143  | 0.20 mm            | UV <sub>254</sub>     |



## Unmodified HPTLC silica layers



### Nano-DURASIL <sup>G</sup> unmodified HPTLC silica layers

#### Technical characteristics

- Nano silica 60, mean pore size 60 Å, specific surface (BET) ~ 500 m<sup>2</sup>/g, specific pore volume 0.75 mL/g, particle size 2–10 µm
- Indicator: manganese activated zinc silicate with green fluorescence for short-wave UV (254 nm)
- Hard, water-resistant and wettable layers due to a special binder system
- Different selectivity compared to ADAMANT and SIL-G plates no reversed phase tendency, more polar than Nano-SIL

#### Ordering information

| Plate size [cm]                   | 10 x 10 | 10 x 20 | Thickness of layer | Fluorescent indicator |
|-----------------------------------|---------|---------|--------------------|-----------------------|
| Pack of [plates]                  | 25      | 50      |                    |                       |
| <b>Glass plates</b>               |         |         |                    |                       |
| Nano-DURASIL-20                   | 812010  | 812011  | 0.20 mm            | –                     |
| Nano-DURASIL-20 UV <sub>254</sub> | 812013  | 812014  | 0.20 mm            | UV <sub>254</sub>     |



## MACHEREY-NAGEL CHROMABOND® SPE and Flash products

### High-performance products for sample preparation

- Comprehensive range of RP- and normal phases as well as ion exchangers
- Polymer and silica based phases
- Phases for special applications like food or environmental analysis
- SPE polypropylene columns and cartridges, MULTI 96 plates and SPE accessories
- High throughput SPE
- Flash chromatography cartridges



More information from page 9 onwards as well as online at [www.mn-net.com/chroma](http://www.mn-net.com/chroma)



## Nano-SIL C18 <sup>G</sup> octadecyl-modified HPTLC silica layers

### Technical characteristics

- Nano silica 60, mean pore size 60 Å, specific surface (BET) ~ 500 m<sup>2</sup>/g, specific pore volume 0.75 mL/g, pH stability 2–10, particle size 2–10 µm
- Indicator: acid-resistant product with a pale blue fluorescence for short-wave UV (254 nm), UV-absorbing substances appear as dark-blue to black spots on a light-blue background

### Modification

- Partial (50 %) or complete (100 %) octadecyl modification, carbon content 7.5 and 14 %, respectively
- Order of polarity: silica > DIOL > NH<sub>2</sub> > CN > RP-2 > C18-50 > RP-18 W > C18-100

### Recommended application

- Reversed phase separation mode with eluents from anhydrous solvents to mixtures with high concentrations of water (see table and figure below)
- Alkaloids, amino acids, preservatives, optical brighteners, barbiturates, polycyclic aromatic hydrocarbons (PAH), drugs, peptides, flavonoids, phenols, indole derivatives, steroids

### Ordering information

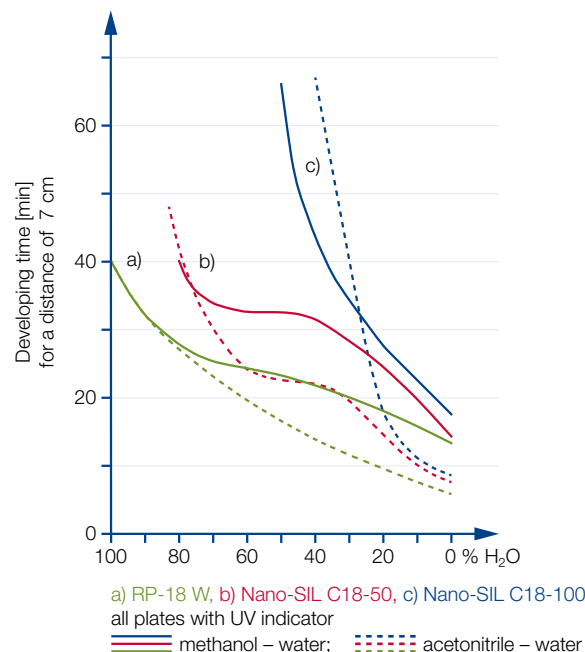
|                  |         |                    |                       |
|------------------|---------|--------------------|-----------------------|
| Plate size [cm]  | 10 x 10 | Thickness of layer | Fluorescent indicator |
| Pack of [plates] | 25      |                    |                       |

### Glass plates

|                                    |                 |        |         |                   |
|------------------------------------|-----------------|--------|---------|-------------------|
| Nano-SIL C18-50                    | 50 % silanized  | 811054 | 0.20 mm | –                 |
| Nano-SIL C18-50 UV <sub>254</sub>  | 50 % silanized  | 811064 | 0.20 mm | UV <sub>254</sub> |
| Nano-SIL C18-100                   | 100 % silanized | 811052 | 0.20 mm | –                 |
| Nano-SIL C18-100 UV <sub>254</sub> | 100 % silanized | 811062 | 0.20 mm | UV <sub>254</sub> |

| Eluent                          | v/v | Migration distances [mm/15 min] |         |         |
|---------------------------------|-----|---------------------------------|---------|---------|
|                                 |     | C18-50                          | C18-100 | RP-18 W |
| Methanol – H <sub>2</sub> O     | 2:1 | 57                              | 45      | 44      |
|                                 | 1:1 | 52                              | 21      | 40      |
|                                 | 1:2 | 50                              | 0       | 43      |
|                                 | 1:3 | 40                              | 0       | 45      |
|                                 | 1:4 | 30                              | 0       | 46      |
| Acetonitrile – H <sub>2</sub> O | 0:1 | 0                               | 0       | 54      |
|                                 | 2:1 | 62                              | 46      | 66      |
|                                 | 1:1 | 52                              | 30      | 54      |
|                                 | 1:2 | 51                              | 27      | 46      |
|                                 | 1:3 | 48                              | 15      | 44      |
| Trichloromethane                | 1:9 | 20                              | 0       | 42      |
|                                 |     | 68                              | 64      | 71      |

Migration of C18-50 and C18-100 silica layers as compared to RP-18 W plates

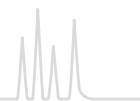


Elution properties of MN RP plates in mixtures of methanol – water and acetonitrile – water

Further application examples can be found online in our application database at [www.mn-net.com/apps](http://www.mn-net.com/apps)



# Modified silica layers



## RP-18 W/UV<sub>254</sub> G A octadecyl-modified HPTLC silica layers

### 🔧 Technical characteristics

- Nano silica 60, mean pore size 60 Å, specific surface (BET) ~ 500 m<sup>2</sup>/g, specific pore volume 0.75 mL/g, particle size 2–10 µm, for preparative plates (1 mm thickness of layer) standard silica 60, pH stability 2–10, particle size 5–17 µm
- Indicator: acid-resistant product with a pale blue fluorescence for short-wave UV (254 nm), UV-absorbing substances appear as dark-blue to black spots on a light-blue background

### 🔧 Modification

- Partial octadecyl (C<sub>18</sub>) modification, wettable with water, carbon content 14 %
- Order of polarity: silica > DIOL > NH<sub>2</sub> > CN > RP-2 > C18-50 > RP-18 W > C18-100

### ✅ Recommended application

- NP or RP separation with eluents from anhydrous solvents to mixtures with high concentrations of water (see table and figure on previous page), relative polarity of the eluent determines the polarity of the layer
- Aminophenols, barbiturates, preservatives, nucleobases, polycyclic aromatic hydrocarbons, steroids, tetracyclines, plasticizers (phthalates)

### Ordering information

| Plate size [cm]                    | 4 x 8  | 5 x 10 | 5 x 20 | 10 x 10 | 10 x 20 | 20 x 20 | Thickness of layer | Fluorescent indicator |
|------------------------------------|--------|--------|--------|---------|---------|---------|--------------------|-----------------------|
| <b>Glass plates</b>                |        |        |        |         |         |         |                    |                       |
| Pack of [plates]                   |        |        | 50     | 25      | 50      | 25      |                    |                       |
| RP-18 W/UV <sub>254</sub>          |        |        | 811073 | 811075  | 811072  | 811071  | 0.25 mm            | UV <sub>254</sub>     |
| Pack of [plates] (preparative TLC) |        |        |        |         |         | 15      |                    |                       |
| RP-18 W/UV <sub>254</sub>          |        |        |        |         |         | 811074  | 1.00 mm            | UV <sub>254</sub>     |
| <b>ALUGRAM® aluminum sheets</b>    |        |        |        |         |         |         |                    |                       |
| Pack of [plates]                   | 50     | 50     | 50     | 25      |         | 25      |                    |                       |
| RP-18 W/UV <sub>254</sub>          | 818144 | 818152 | 818145 | 818147  |         | 818146  | 0.15 mm            | UV <sub>254</sub>     |

## RP-2/UV<sub>254</sub> G A "silanized silica" = dimethyl-modified standard silica layers

### 🔧 Technical characteristics

- Silica 60, mean pore size 60 Å, specific surface (BET) ~ 500 m<sup>2</sup>/g, specific pore volume 0.75 mL/g, pH stability 2–10, particle size 5–17 µm
- Indicator: acid-resistant product with a pale blue fluorescence for short-wave UV (254 nm), UV-absorbing substances appear as dark-blue to black spots on a light-blue background

### 🔧 Modification

- Silanized silica with dimethyl modification, carbon content 4 %
- Order of polarity: silica > DIOL > NH<sub>2</sub> > CN > RP-2 > C18-50 > RP-18 W > C18-100

### ✅ Recommended application

- Normal phase or reversed phase separation modes with purely organic, organic - aqueous or purely aqueous eluents
- Active plant constituents, steroids

### Ordering information

| Plate size [cm]                 | 10 x 20 | 20 x 20 | Thickness of layer | Fluorescent indicator |
|---------------------------------|---------|---------|--------------------|-----------------------|
| Pack of [plates]                | 50      | 25      |                    |                       |
| <b>Glass plates</b>             |         |         |                    |                       |
| RP-2/UV <sub>254</sub>          | 811081  | 811082  | 0.25 mm            | UV <sub>254</sub>     |
| <b>ALUGRAM® aluminum sheets</b> |         |         |                    |                       |
| RP-2/UV <sub>254</sub>          |         | 818171  | 0.15 mm            | UV <sub>254</sub>     |



## Nano-SIL CN G A cyano-modified HPTLC silica layers

### Technical characteristics

- Nano silica 60, mean pore size 60 Å, specific surface (BET) ~ 500 m<sup>2</sup>/g, specific pore volume 0.75 mL/g, pH stability 2–8, particle size 2–10 µm
- Indicator: acid-resistant product with a pale blue fluorescence for short-wave UV (254 nm), UV-absorbing substances appear as dark-blue to black spots on a light-blue background

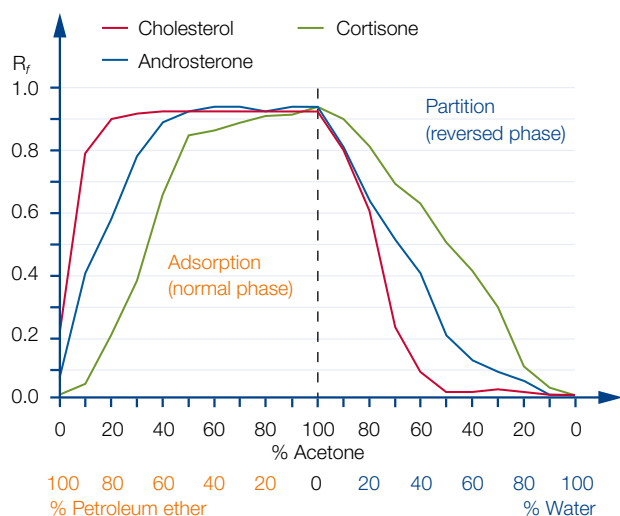
### Modification

- Cyanopropyl modification, carbon content 5.5 %
- Order of polarity: silica > DIOL > NH<sub>2</sub> > CN > RP-2 > C18-50 > RP-18 W > C18-100

### Recommended application

- NP or RP separation modes depending on the polarity of the developing solvent (see figure below)
- Steroid hormones, phenols, preservatives

*R<sub>f</sub>* values of different steroids as a function of eluent composition



Layer: Nano-SIL CN/UV

Polarity of the eluent governs the type of separation mechanism:

**Eluent system petroleum ether (PE) – acetone (NP mode)**

the higher the concentration of PE, the stronger are the adsorptive interactions of the steroids with the stationary phase

**Eluent system acetone – water (RP mode)**

the sequence of elution of the steroids is reversed, the most nonpolar compounds are most strongly retained

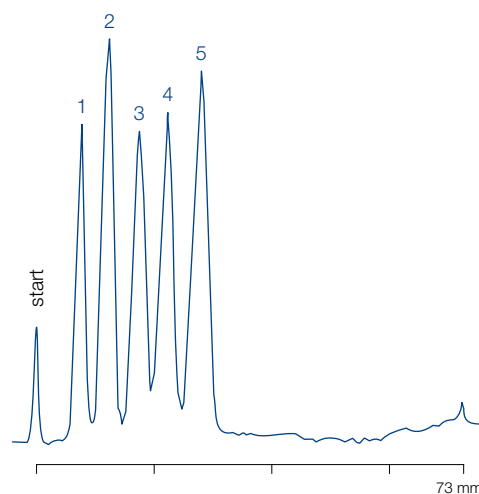
### Separation of preservatives

MN Appl. No. 401440

Layer: Nano-SIL CN/UV  
 Sample volume: 400 nL  
 Eluent: ethanol – water – glacial acetic acid (20:80:0.2) with 0.1 mol/L tetraethylammonium chloride  
 Migration distance: 73 mm in 30 min  
 Detection: TLC scanner, UV 254 nm

Peaks:

1. Propyl p-hydroxybenzoate
2. Ethyl p-hydroxybenzoate
3. Methyl p-hydroxybenzoate
4. Benzoic acid
5. Sorbic acid

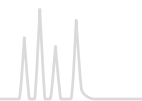


### Ordering information

| Plate size [cm]                 | 4 x 8  | 10 x 10 | 10 x 20 | Thickness of layer | Fluorescent indicator |
|---------------------------------|--------|---------|---------|--------------------|-----------------------|
| Pack of [plates]                | 50     | 25      | 25      |                    |                       |
| <b>Glass plates</b>             |        |         |         |                    |                       |
| Nano-SIL CN/UV                  |        | 811115  | 811116  | 0.20 mm            | UV <sub>254</sub>     |
| <b>ALUGRAM® aluminum sheets</b> |        |         |         |                    |                       |
| Nano-SIL CN/UV                  | 818184 |         |         | 0.15 mm            | UV <sub>254</sub>     |



# Modified silica layers



## Nano-SIL NH<sub>2</sub> G A amino-modified HPTLC silica layers

### Technical characteristics

- Nano silica 60, mean pore size 60 Å, specific surface (BET) ~ 500 m<sup>2</sup>/g, specific pore volume 0.75 mL/g, pH stability 2–8, particle size 2–10 µm
- Indicator: acid-resistant product with a pale blue fluorescence for short-wave UV (254 nm), UV-absorbing substances appear as dark-blue to black spots on a light-blue background

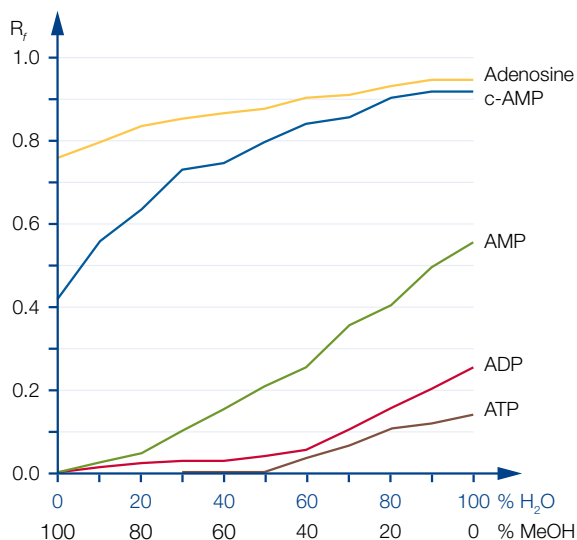
### Modification

- Aminopropyl modification, carbon content 3.5 %
- Order of polarity: silica > DIOL > NH<sub>2</sub> > CN > RP-2 > C18-50 > RP-18 W > C18-100
- Layer can be wetted equally well with pure water as with organic solvents

### Recommended application

- Vitamins, sugars, steroids, purine derivatives, xanthines, phenols, nucleotides and pesticides

Influence of eluent composition on the separation of nucleotides



Layer: Nano-SIL NH<sub>2</sub>/UV  
 Eluent: MeOH – H<sub>2</sub>O according to fig. + 0.18 mol/L NaCl

Migration distance: 7 cm

c-AMP, AMP: adenosine monophosphate  
 ADP: adenosine diphosphate  
 ATP: adenosine triphosphate

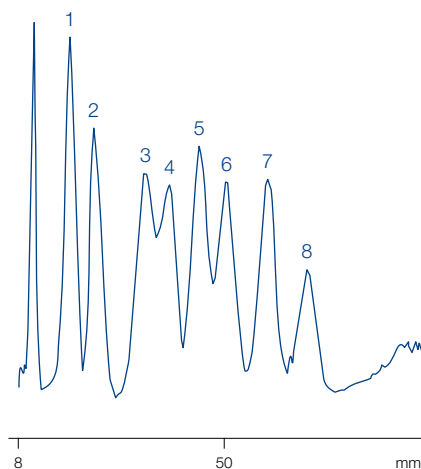
### Separation of sugars

MN Appl. No. 401590

Layer: Nano-SIL NH<sub>2</sub>/UV  
 Sample volume: 0.5 µL  
 Eluent: ethyl acetate – pyridine – water – glacial acetic acid (60:30:10:5, v/v/v/v)  
 Migration distance: 80 mm in 45 min, double development  
 Detection: dry layer at 160 °C for 5 min, TLC scanner, UV 254 nm

Peaks (0.1 % each):

1. Lactose
2. Saccharose
3. Galactose
4. Glucose
5. Fructose
6. Arabinose
7. Xylose
8. Ribose



### Ordering information

| Plate size [cm]  | 4 x 8 | 10 x 10 | 10 x 20 | Thickness of layer | Fluorescent indicator |
|------------------|-------|---------|---------|--------------------|-----------------------|
| Pack of [plates] | 50    | 25      | 25      |                    |                       |

### Glass plates

|                              |        |        |         |                   |
|------------------------------|--------|--------|---------|-------------------|
| Nano-SIL NH <sub>2</sub> /UV | 811111 | 811112 | 0.20 mm | UV <sub>254</sub> |
|------------------------------|--------|--------|---------|-------------------|

### ALUGRAM® aluminum sheets

|                              |        |  |         |                   |
|------------------------------|--------|--|---------|-------------------|
| Nano-SIL NH <sub>2</sub> /UV | 818182 |  | 0.15 mm | UV <sub>254</sub> |
|------------------------------|--------|--|---------|-------------------|

Further application examples can be found online in our application database at [www.mn-net.com/apps](http://www.mn-net.com/apps)



## Nano-SIL DIOL diol-modified HPTLC silica layers

### Technical characteristics

- Nano silica 60, mean pore size 60 Å, specific surface (BET) ~ 500 m<sup>2</sup>/g, specific pore volume 0.75 mL/g, pH stability 2–8, particle size 2–10 µm
- Indicator: acid-resistant product with a pale blue fluorescence for short-wave UV (254 nm), UV-absorbing substances appear as dark-blue to black spots on a light-blue background

### Modification

- Diol modification, carbon content 5.5 %
- Order of polarity: silica > DIOL > NH<sub>2</sub> > CN > RP-2 > C18-50 > RP-18 W > C18-100
- Layer can be wetted equally well with pure water as with organic solvents

### Recommended application

- Steroids, pesticides and plant constituents
- For critical separations an alternative to silica
- Since it is less sensitive to the water content of the environment, leads to more reproducible results compared to silica

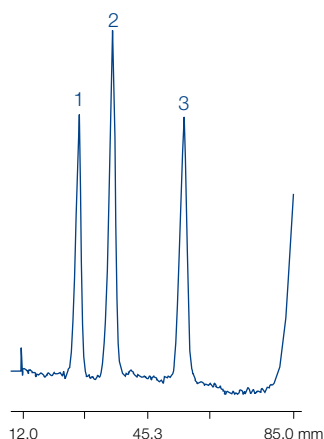
### Separation of herbicides

MN Appl. No. 401950

Layer: Nano-SIL DIOL/UV  
Sample volume: 2 µL  
Eluent: petroleum ether (40–60 °C) – acetone (80:20, v/v)  
Migration distance: 70 mm  
Detection: TLC scanner, 230 nm

Peaks:  
(0.07 % each in methanol)

1. Metoxuron
2. Monuron
3. Metobromuron

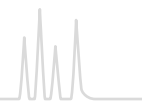


### Ordering information

|                  |         |                    |                       |
|------------------|---------|--------------------|-----------------------|
| Plate size [cm]  | 10 x 10 | Thickness of layer | Fluorescent indicator |
| Pack of [plates] | 25      |                    |                       |

### Glass plates

|                  |        |         |                   |
|------------------|--------|---------|-------------------|
| Nano-SIL DIOL/UV | 811120 | 0.20 mm | UV <sub>254</sub> |
|------------------|--------|---------|-------------------|

Alox **G P A** aluminum oxide layers**Technical characteristics**

- Aluminum oxide, mean pore size 60 Å, specific surface (BET) ~ 200 m<sup>2</sup>/g
- Inert organic binder
- Indicator: manganese-activated zinc silicate

**Recommended application**

- Terpenes, alkaloids, steroids, aliphatic and aromatic compounds
- We recommend to activate aluminum oxide layers before use by heating 10 minutes at 120 °C

## Separation of bisadducts of fullerenes

MN Appl. No. 401930

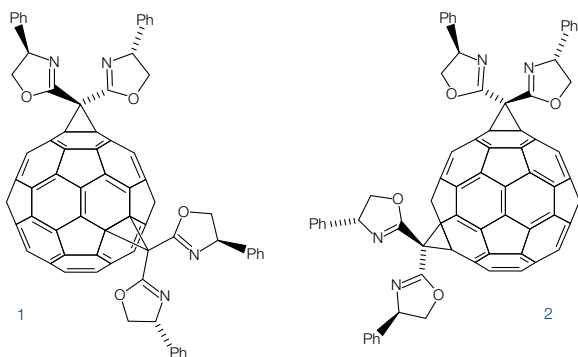
F. Djojo, A. Hirsch, Chem. Eur. J. 4 (1998), 344–356

Layer: ALUGRAM® Alox N/UV<sub>254</sub>

Eluent: toluene – ethyl acetate (95:5, v/v)

Detection: UV, 254 nm

| Compound                                     | R <sub>f</sub> values |
|----------------------------------------------|-----------------------|
| Bis[bis(4-phenyloxazolin)methane]fullerene 1 | 0.14                  |
| Bis[bis(4-phenyloxazolin)methane]fullerene 2 | 0.26                  |



## Separation of lipophilic dyes

MN Appl. No. 403010

Layer: Alox-25 UV<sub>254</sub>

Sample volume: 1000 nL

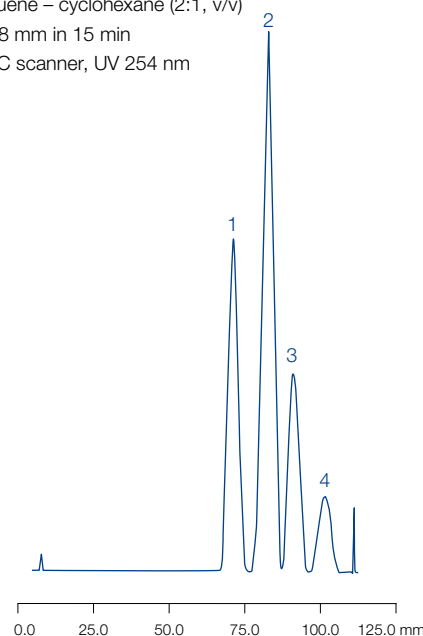
Eluent: toluene – cyclohexane (2:1, v/v)

Migration distance: 108 mm in 15 min

Detection: TLC scanner, UV 254 nm

Peaks:

1. Indophenol
2. Sudan red G
3. Sudan blue II
4. Butter yellow



## Ordering information

| Plate size [cm]                    | 4 x 8  | 5 x 20 | 20 x 20 | Thickness of layer | Fluorescent indicator |
|------------------------------------|--------|--------|---------|--------------------|-----------------------|
| <b>Glass plates</b>                |        |        |         |                    |                       |
| Pack of [plates]                   |        | 100    | 25      |                    |                       |
| Alox-25 UV <sub>254</sub>          |        | 807021 | 807023  | 0.25 mm            | UV <sub>254</sub>     |
| Pack of [plates] (preparative TLC) |        |        | 15      |                    |                       |
| Alox-100 UV <sub>254</sub>         |        |        | 807033  | 1.00 mm            | UV <sub>254</sub>     |
| <b>POLYGRAM® polyester sheets</b>  |        |        |         |                    |                       |
| Pack of [plates]                   | 50     | 50     | 25      |                    |                       |
| Alox N/UV <sub>254</sub>           | 802021 | 802022 | 802023  | 0.20 mm            | UV <sub>254</sub>     |
| <b>ALUGRAM® aluminum sheets</b>    |        |        |         |                    |                       |
| Pack of [plates]                   |        | 50     | 25      |                    |                       |
| Alox N/UV <sub>254</sub>           |        | 818024 | 818023  | 0.20 mm            | UV <sub>254</sub>     |

Further application examples can be found online in our application database at [www.mn-net.com/apps](http://www.mn-net.com/apps)



## Cellulose MN 300 G P A native fibrous cellulose layers

### 🔧 Technical characteristics

- Fiber length (95 %) 2–20 µm, average degree of polymerization 400–500, specific surface acc. to Blaine 15 000 cm<sup>2</sup>/g, ≤ 20 ppm Fe, 6 ppm Cu, 7 ppm P; CH<sub>2</sub>Cl<sub>2</sub>- extract ≤ 0.25 %; residue on ignition at 850 °C ≤ 1500 ppm

### ✅ Recommended application

- Partition chromatography of polar substances such as amino acids, carboxylic acids or carbohydrates

### Ordering information

| Plate size [cm]                    | 4 x 8  | 5 x 20 | 20 x 20 | Thickness of layer | Fluorescent indicator |
|------------------------------------|--------|--------|---------|--------------------|-----------------------|
| <b>Glass plates</b>                |        |        |         |                    |                       |
| Pack of [plates]                   |        |        | 25      |                    |                       |
| CEL 300-10                         |        |        | 808013  | 0.10 mm            | –                     |
| CEL 300-10 UV <sub>254</sub>       |        |        | 808023  | 0.10 mm            | UV <sub>254</sub>     |
| CEL 300-25                         |        |        | 808033  | 0.25 mm            | –                     |
| CEL 300-25 UV <sub>254</sub>       |        |        | 808043  | 0.25 mm            | UV <sub>254</sub>     |
| Pack of [plates] (preparative TLC) |        |        | 20      |                    |                       |
| CEL 300-50                         |        |        | 808053  | 0.50 mm            | –                     |
| CEL 300-50 UV <sub>254</sub>       |        |        | 808063  | 0.50 mm            | UV <sub>254</sub>     |
| <b>POLYGRAM® polyester sheets</b>  |        |        |         |                    |                       |
| Pack of [plates]                   | 50     | 50     | 25      |                    |                       |
| CEL 300                            | 801011 |        | 801013  | 0.10 mm            | –                     |
| CEL 300 UV <sub>254</sub>          |        | 801022 | 801023  | 0.10 mm            | UV <sub>254</sub>     |
| <b>ALUGRAM® aluminum sheets</b>    |        |        |         |                    |                       |
| Pack of [plates]                   | 50     | 50     | 25      |                    |                       |
| CEL 300                            | 818155 |        | 818153  | 0.10 mm            | –                     |
| CEL 300 UV <sub>254</sub>          |        | 818157 | 818156  | 0.10 mm            | UV <sub>254</sub>     |

## Cellulose MN 400 (AVICEL®) G P microcrystalline cellulose layers

### 🔧 Technical characteristics

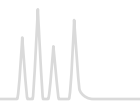
- Prepared by hydrolysis of high purity cellulose with HCl, average degree of polymerization 40–200

### ✅ Recommended application

- Carboxylic acids, lower alcohols, urea and purine derivatives

### Ordering information

| Plate size [cm]                   | 10 x 20 | 20 x 20 | Thickness of layer | Fluorescent indicator |
|-----------------------------------|---------|---------|--------------------|-----------------------|
| Pack of [plates]                  | 50      | 25      |                    |                       |
| <b>Glass plates</b>               |         |         |                    |                       |
| CEL 400-10                        | 808072  | 808073  | 0.10 mm            | –                     |
| <b>POLYGRAM® polyester sheets</b> |         |         |                    |                       |
| CEL 400                           |         | 801113  | 0.10 mm            | –                     |
| CEL 400 UV <sub>254</sub>         |         | 801123  | 0.10 mm            | UV <sub>254</sub>     |



## Cellulose MN 300 PEI <sup>P</sup> PEI-impregnated cellulose ion exchange layers

### 🔧 Technical characteristics

- Fibrous cellulose impregnated with polyethyleneimine

### ✅ Recommended application

- Analysis of nucleic acids, and of mutagenic substances with the <sup>32</sup>P postlabelling procedure

### Ordering information

|                  |         |                    |                       |
|------------------|---------|--------------------|-----------------------|
| Plate size [cm]  | 20 x 20 | Thickness of layer | Fluorescent indicator |
| Pack of [plates] | 25      |                    |                       |

### POLYGRAM® polyester sheets

|                               |        |         |                   |
|-------------------------------|--------|---------|-------------------|
| CEL 300 PEI                   | 801053 | 0.10 mm | –                 |
| CEL 300 PEI/UV <sub>254</sub> | 801063 | 0.10 mm | UV <sub>254</sub> |

## Cellulose MN 300 AC <sup>P</sup> acetylated cellulose layers

### 🔧 Technical characteristics

- Fibrous cellulose with 10 % content of acetylated cellulose for reversed phase chromatography

### ✅ Recommended application

- Reversed phase chromatography

### Ordering information

|                  |                |         |                    |                       |
|------------------|----------------|---------|--------------------|-----------------------|
| Plate size [cm]  | Acetyl content | 20 x 20 | Thickness of layer | Fluorescent indicator |
| Pack of [plates] |                | 25      |                    |                       |

### POLYGRAM® polyester sheets

|                 |      |        |         |   |
|-----------------|------|--------|---------|---|
| CEL 300 AC-10 % | 10 % | 801033 | 0.10 mm | – |
|-----------------|------|--------|---------|---|

## Polyamid-6 <sup>P</sup> ε-polycaprolactame layers

### 🔧 Technical characteristics

- Polyamide 6 = nylon 6 = perlon = ε-aminopolycaprolactame
- Separation mechanism based on hydrogen bonds to amide groups of the polymer matrix as well as on ionic, dipole and electron donor-acceptor interactions

### ✅ Recommended application

- Natural compounds, phenols, carboxylic acids, aromatic nitro compounds and especially amino acids

### Ordering information

|                  |        |         |                    |                       |
|------------------|--------|---------|--------------------|-----------------------|
| Plate size [cm]  | 5 x 20 | 20 x 20 | Thickness of layer | Fluorescent indicator |
| Pack of [plates] | 50     | 25      |                    |                       |

### POLYGRAM® polyester sheets

|                              |        |        |         |                   |
|------------------------------|--------|--------|---------|-------------------|
| POLYAMID-6                   | 803012 | 803013 | 0.10 mm | –                 |
| POLYAMID-6 UV <sub>254</sub> | 803022 | 803023 | 0.10 mm | UV <sub>254</sub> |

Further application examples can be found online in our application database at [www.mn-net.com/apps](http://www.mn-net.com/apps)



## CHIRALPLATE <sup>G</sup> special layer enantiomer separation

### Technical characteristics

- Reversed phase nano silica impregnated with Cu<sup>2+</sup> ions and a chiral selector (proline derivative)
- Separation based on ligand exchange, i.e. formation of ternary mixed-ligand complexes with the Cu(II) ions, differences in the stability of the diastereomeric complexes cause chromatographic separation

### Recommended application

- Enantiomer separation of amino acids, *N*-methylamino acids, *N*-formylamino acids,  $\alpha$ -alkylamino acids, thiazolidine derivatives, dipeptides, lactones,  $\alpha$ -hydroxycarboxylic acids

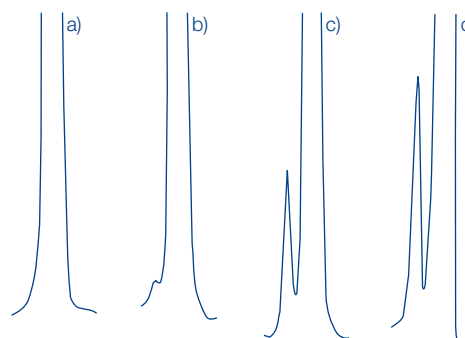
### Enantiomer separation of amino acids

MN Appl. No. 400520

Quantitative determination (remission location curves) of TLC-separated enantiomers of *tert*.-leucine:

Layer: CHIRALPLATE  
Eluent: methanol – water (10:80, v/v)  
Detection: dip in 0.3 % ninhydrin solution  
quantification with scanner, 520 nm

- a) L-*tert*.-leucine  
b) L-*tert*.-leucine + 0.1 % D-*tert*.-leucine  
c) L-*tert*.-leucine + 1 % D-*tert*.-leucine  
d) external reference sample



### Ordering information

| Plate size [cm]     | 5 x 20 | 10 x 10 | 10 x 20 | 20 x 20 | Thickness of layer | Fluorescent indicator |
|---------------------|--------|---------|---------|---------|--------------------|-----------------------|
| <b>Glass plates</b> |        |         |         |         |                    |                       |
| Pack of [plates]    |        |         |         | 4       |                    |                       |
| CHIRALPLATE         |        |         | 811056  |         | 0.25 mm            | UV <sub>254</sub>     |
| Pack of [plates]    | 50     | 25      | 25      | 25      |                    |                       |
| CHIRALPLATE         | 811057 | 811059  | 811055  | 811058  | 0.25 mm            | UV <sub>254</sub>     |

## SIL N-HR <sup>P</sup> unmodified standard silica layers

### Technical characteristics

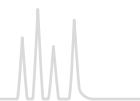
- High purity silica 60, mean pore size 60 Å, specific surface (BET) ~ 500 m<sup>2</sup>/g, specific pore volume 0.75 mL/g, particle size 5–17 µm, different binder system compared to SIL G results in different separation characteristics
- A special feature of the POLYGRAM® SIL N-HR is a higher gypsum content

### Ordering information

| Plate size [cm]                   | 5 x 20 | 20 x 20 | Thickness of layer | Fluorescent indicator |
|-----------------------------------|--------|---------|--------------------|-----------------------|
| Pack of [plates]                  | 50     | 25      |                    |                       |
| <b>POLYGRAM® polyester sheets</b> |        |         |                    |                       |
| SIL N-HR/UV <sub>254</sub>        | 804022 | 804023  | 0.20 mm            | UV <sub>254</sub>     |



# Layers for special TLC separations



## SIL G-25 HR special layer for aflatoxin separation

### Technical characteristics

- High purity silica 60 with gypsum and a very small quantity of a polymeric organic binder; softer than the standard silica layer, i.e. spots can be scratched and the layer absorbs faster

### Recommended application

- Aflatoxins

### Ordering information

|                  |         |                    |                       |
|------------------|---------|--------------------|-----------------------|
| Plate size [cm]  | 20 x 20 | Thickness of layer | Fluorescent indicator |
| Pack of [plates] | 25      |                    |                       |

### Glass plates

|                               |        |         |                   |
|-------------------------------|--------|---------|-------------------|
| SIL G-25 HR                   | 809033 | 0.25 mm | –                 |
| SIL G-25 HR/UV <sub>254</sub> | 809043 | 0.25 mm | UV <sub>254</sub> |

## SIL G-25 Tenside special layer for separation of surfactants

### Technical characteristics

- Silica G impregnated with ammonium sulfate

### Recommended application

- Detergents, alkanesulfonates, polyglycols

### Ordering information

|                  |         |                    |                       |
|------------------|---------|--------------------|-----------------------|
| Plate size [cm]  | 20 x 20 | Thickness of layer | Fluorescent indicator |
| Pack of [plates] | 25      |                    |                       |

### Glass plates

|                  |        |         |   |
|------------------|--------|---------|---|
| SIL G-25 Tenside | 810063 | 0.25 mm | – |
|------------------|--------|---------|---|

## Nano-SIL PAH special HPTLC silica layer for PAH analysis

### Technical characteristics

- Nano silica 60, mean pore size 60 Å, specific surface (BET) ~ 500 m<sup>2</sup>/g, specific pore volume 0.75 mL/g, particle size 2–10 µm
- Impregnated with caffeine, an electron acceptor for PAH analysis based on charge-transfer complexes

### Recommended application

- 6 PAHs according to German drinking water specifications (TVO) in accordance with German standard DIN 38407 part 7

### Ordering information

|                  |         |                    |                       |
|------------------|---------|--------------------|-----------------------|
| Plate size [cm]  | 10 x 20 | Thickness of layer | Fluorescent indicator |
| Pack of [plates] | 50      |                    |                       |

### Glass plates

|              |        |         |   |
|--------------|--------|---------|---|
| Nano-SIL PAH | 811051 | 0.20 mm | – |
|--------------|--------|---------|---|

Further application examples can be found online in our application database at [www.mn-net.com/apps](http://www.mn-net.com/apps)



# Layers for special TLC separations



## IONEX <sup>P</sup> special mixed layers of silica with ion exchange resins

### IONEX-25 SA-Na:

- Mixture of silica and a strongly acidic cation exchanger coated to polyester sheets

### IONEX-25 SB-AC:

- Mixture of silica and a strongly basic anion exchanger coated to polyester sheets
- Both layers contain an inert organic binder

### ✓ Recommended application

- Amino acids, e.g., in protein and peptide hydrolyzates, in seeds and fodder, in biological fluids; for racemate separation in peptide syntheses, for the separation of nucleic acid hydrolyzates, aminosugars, amino acids, antibiotics, inorganic phosphates, cations and other compounds with ionic groups

### Ordering information

|                  |         |                    |                       |
|------------------|---------|--------------------|-----------------------|
| Plate size [cm]  | 20 x 20 | Thickness of layer | Fluorescent indicator |
| Pack of [plates] | 25      |                    |                       |

### POLYGRAM<sup>®</sup> polyester sheets

|                |                                  |        |         |   |
|----------------|----------------------------------|--------|---------|---|
| IONEX-25 SA-Na | strongly acidic cation exchanger | 806013 | 0.20 mm | – |
| IONEX-25 SB-AC | strongly basic anion exchanger   | 806023 | 0.20 mm | – |

## Mixed layers for TLC <sup>G</sup>

### Alox/CEL-AC-Mix-25:

- Mixed layer of aluminum oxide G and acetylated cellulose, recommended for separation of PAH

### SILCEL-Mix-25:

- Mixed layer of cellulose and silica, recommended for separation of preservatives and other antimicrobial compounds

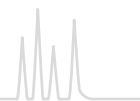
### Ordering information

|                  |         |                    |                       |
|------------------|---------|--------------------|-----------------------|
| Plate size [cm]  | 20 x 20 | Thickness of layer | Fluorescent indicator |
| Pack of [plates] | 25      |                    |                       |

### Glass plates

|                                 |        |         |                   |
|---------------------------------|--------|---------|-------------------|
| Alox/CEL-AC-Mix-25              | 810053 | 0.25 mm | –                 |
| SILCEL-Mix-25 UV <sub>254</sub> | 810043 | 0.25 mm | UV <sub>254</sub> |

Further application examples can be found online in our application database at [www.mn-net.com/apps](http://www.mn-net.com/apps)



## Chromatography papers

### Chromatography papers

- Paper chromatography is the oldest chromatographic technique separation due to partition of the analytes between special paper grades and the mobile phase, which penetrates the paper by capillary action ascending.
- Descending and circular techniques are possible

### Please note

- Always treat chromatography papers with care
- Never touch them with fingers, because this will contaminate the surface
- Do not bend them sharply, because this will decrease the capillary action (preferably store them flat)

### Direction

- Chromatography papers possess a preferred direction of the fibers with higher absorption properties (with our sheets 58 x 60 cm, the longer edge)
- We recommend to use them in the direction of higher absorption

### Ordering information

| Code      | Weight [g/m <sup>2</sup> ] | Thickness [mm] | Description       | Flow rate         | Size [cm] | Pack of    | REF    |
|-----------|----------------------------|----------------|-------------------|-------------------|-----------|------------|--------|
| MN 214    | 140                        | 0.28           | smooth            | 90–100 mm/30 min  | 58 x 60   | 100 sheets | 817001 |
| MN 218    | 180                        | 0.36           | smooth            | 90–100 mm/30 min  | 58 x 60   | 100 sheets | 817002 |
| MN 260    | 90                         | 0.20           | smooth            | 120–130 mm/30 min | 58 x 60   | 100 sheets | 817003 |
| MN 261    | 90                         | 0.18           | smooth            | 90–100 mm/30 min  | 58 x 60   | 100 sheets | 817004 |
| MN 827    | 270                        | 0.70           | soft carton       | 130–140 mm/10 min | 58 x 60   | 100 sheets | 817005 |
| MN 866    | 650                        | 1.70           | soft carton       | 100–120 mm/10 min | 38 x 38   | 100 sheets | 817006 |
| MN 866    | 650                        | 1.70           | soft carton       | 100–120 mm/10 min | 80 x 80   | 100 sheets | 817007 |
| MN 214 ff | 140                        | 0.28           | MN 214 defatted * | 90–100 mm/30 min  | 56 x 58   | 100 sheets | 817008 |

\* This paper is extracted with organic solvents.

For further papers, filters and membranes, feel free to ask for our catalog "Filtration".





## Accessories

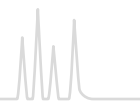
• Beside ready-to-use layers for thin layer chromatography also accessories are required

• Selection of accessories for reliable separation in TLC

### Ordering information

| Designation                                                       | Pack of | REF    |
|-------------------------------------------------------------------|---------|--------|
| Simultaneous developing chamber for TLC, 20 x 20 cm               | 1       | 814019 |
| Simultaneous developing chamber for TLC, 10 x 10 cm               | 1       | 814018 |
| Developing chambers for TLC micro-sets                            | 4       | 814021 |
| Glass laboratory sprayer with rubber bulb                         | 1       | 814101 |
| Glass capillaries 1 µL                                            | 3 x 50  | 814022 |
| Rubber caps for capillaries                                       | 2       | 814102 |
| Plastic syringe, 1 mL content with graduation                     | 1       | 814104 |
| Spotting guides                                                   | 2       | 814023 |
| Measuring cylinders, glass, 10 mL content                         | 2       | 814024 |
| MN ALUGRAM® scissors, ground blade, black handle                  | 1       | 818666 |
| Filter paper MN 713, 15 x 21 cm                                   | 100     | 814103 |
| Folded filters MN 615 1/4, 11 cm diameter                         | 100     | 531011 |
| Chromatography paper MN 260, 7.5 x 17 cm (for chamber saturation) | 100     | 814030 |





## Visualization reagents

- Small selection of frequently used spray reagents for post chromatographic detection reactions in TLC suited for spraying or dipping TLC plates
- A detailed description of many more detection procedures for TLC is available on request

### Ordering information

| Spray reagent                           | Solvent                    | Detection of                                               | Pack of | REF    |
|-----------------------------------------|----------------------------|------------------------------------------------------------|---------|--------|
| Aniline phthalate                       | 2-propanol – ethanol (1:1) | reducing sugars, oxohalic acids                            | 100 mL  | 814919 |
| Bromocresol green                       | 2-propanol                 | organic acids                                              | 100 mL  | 814920 |
| Reagent for caffeine detection          | water – acetone            | caffeine                                                   | 100 mL  | 814401 |
| 2',7'-Dichlorofluorescein               | 2-propanol                 | lipids (saturated, unsaturated)                            | 100 mL  | 814921 |
| 4-(Dimethylamino)-benzaldehyde          | 2-propanol                 | terpenes, sugars, steroids                                 | 100 mL  | 814922 |
| Reagent according to Dragendorff-Munier | water                      | alkaloids and other nitrogen compounds                     | 100 mL  | 814402 |
| Iron(III) chloride                      | water                      | phenolic compounds e.g., acetylsalicylic acid, paracetamol | 100 mL  | 814403 |
| Potassium hexacyanoferrate(III)         | water                      |                                                            | 100 mL  | 814404 |
| Molybdotophosphoric acid                | ethanol                    | lipids, sterols, steroids, reducing compounds              | 100 mL  | 814302 |
| Ninhydrin                               | ethanol                    | amino acids, amines and amino sugars                       | 100 mL  | 814203 |
| Rhodamine B                             | ethanol                    | lipids                                                     | 100 mL  | 814923 |
| Rubeanic acid                           | ethanol                    | heavy metal cations                                        | 100 mL  | 814206 |

These products contain harmful substances which must be specially labeled as hazardous. For detailed information please see SDS.



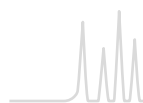
## Fluorescent indicators

UV indicators with efficient radiation for short-wave as well as long-wave UV ranges

- UV<sub>254</sub>: manganese-activated zinc silicate with absorption maximum at 254 nm, green fluorescence, relatively susceptible towards acids: its fluorescence can be completely quenched by acidic solvents
- UV<sub>366</sub>: inorganic fluorescent pigment with absorption maximum at 366 nm, blue fluorescence

### Ordering information

|                                         | Composition                       | Absorption maximum | Color of fluorescence | Pack of 100 g |
|-----------------------------------------|-----------------------------------|--------------------|-----------------------|---------------|
| Fluorescent indicator UV <sub>254</sub> | manganese-activated zinc silicate | 254 nm             | green                 | 816710.01     |
| Fluorescent indicator UV <sub>366</sub> | inorganic fluorescent pigment     | 366 nm             | blue                  | 816720.01     |

**Silica** adsorbent for TLC

Pore size 60 Å, pore volume 0.75 mL/g, specific surface (BET) ~ 500 m<sup>2</sup>/g, pH 7 for a 10 % aqueous suspension

- Silica G: standard grade, particle size 2–20 µm, Fe < 0.02 %, Cl < 0.02 %, 13 % gypsum as binder
- Silica N: standard grade, particle size 2–20 µm, Fe < 0.02 %, Cl < 0.02 %, no binder
- Silica G-HR: high purity grade, particle size 3–20 µm, Fe < 0.002 %, Cl < 0.008 %, gypsum as binder
- Silica P: preparative grade, particle size 5–50 µm, Fe < 0.02 %, Cl < 0.02 %, organic binder
- Silica P with gypsum: preparative grade, particle size 5–50 µm, Fe < 0.02 %, Cl < 0.02 %, gypsum as binder

**Ordering information**

| Designation                             | Fluorescent indicator | 1 kg     | 5 kg     |
|-----------------------------------------|-----------------------|----------|----------|
| Silica G                                | –                     | 816310.1 | 816310.5 |
| Silica G/UV <sub>254</sub>              | UV <sub>254</sub>     | 816320.1 | 816320.5 |
| Silica N                                | –                     | 816330.1 | 816330.5 |
| Silica N/UV <sub>254</sub>              | UV <sub>254</sub>     | 816340.1 | 816340.5 |
| Silica G-HR                             | –                     | 816410.1 | 816410.5 |
| Silica P/UV <sub>254</sub>              | UV <sub>254</sub>     | 816380.1 | 816380.5 |
| Silica P/UV <sub>254</sub> with gypsums | UV <sub>254</sub>     | 816400.1 | 816400.5 |

**Polyamid** adsorbent for TLC

Polyamide 6 = nylon 6 = perlon = ε-polycaprolactame

**Ordering information**

| Designation                     | Fluorescent indicator | 1 kg     |
|---------------------------------|-----------------------|----------|
| Polyamid-DC 6                   | –                     | 816610.1 |
| Polyamid-DC 6 UV <sub>254</sub> | UV <sub>254</sub>     | 816620.1 |

**Cellulose MN 301** native fibrous cellulose

- Standard grade, fiber length (95 %) 2–20 µm
- Average degree of polymerization 400–500, specific surface acc. to Blaine 15 000 cm<sup>2</sup>/g
- ≤ 20 ppm Fe, 6 ppm Cu, 7 ppm P, CH<sub>2</sub>Cl<sub>2</sub> extract ≤ 0.25 %, residue on ignition at 850 °C ≤ 1500 ppm

**Ordering information**

| Designation      | 1 kg     | 5 kg     |
|------------------|----------|----------|
| Cellulose MN 301 | 816250.1 | 816250.5 |