SiliaPlate™ TLC Plates

- **Wide choice of sizes, sorbents & thicknesses available**
- **Excellent reproducibility between Silia*Plate* TLC plates and bulk silicas or Flash cartridges**

The hardness of our silica layer, combined to a homogeneous coating and layer thickness, allows excellent separations. Each TLC batch is chemically and physically controlled by our Quality Control department to ensure lot-to-lot and layer-to-layer reproducibility.

Selection Guide

Plate Types

SiliCycle offers different types of plates for thin-layer chromatography applications: classical TLC, high performance TLC (*also called HPTLC*) and preparative TLC (*PLC*). The plate types are selected based on the analysis required and the available budget.

Differences Between Classical TLC, HPTLC and PLC			
Properties	**Classical TLC**	**HPTLC**	**Preparative (*PLC*)**
Applications	Quick, inexpensive, flexible and classical separations	Highly sophisticated separations, complex samples	Purification on a TLC plate
Analysis	Qualitative	Qualitative & Quantitative	Quantitative
Detection	UV - Stains	Instrumented analysis (*use of scanners for detection*)	UV
Distribution [*Mean Particle Size*]	5 - 20 µm [*10 - 14 µm*]	4 - 8 µm [*5 - 6 µm*]	5 - 40 µm [*22 - 25 µm*]
Layer Thickness	200 - 250 µm	150 - 200 µm	500 - 2,000 µm
Typical Sample Volume	1 - 5 µL	0.1 - 0.5 µL	5 - 20 µL

TLC Backings

TLC plates are available with different backings: rigid (*glass-backed*) and flexible (*aluminum & plastic-backed*)

TLC Backings Comparison			
Properties	**Glass**	**Aluminum**	**Plastic**
Advantages	• Rigid • High chemical resistance • High heating stability and charring resistance • Transparent	• Thin • Low weight & consequent shipping costs • High heating stability • Low fragility • Possible to cut with scissors • Can be stored in notebook	• Thin • Low fragility • Possible to cut with scissors • High chemical resistance • Can be stored in notebook
Disadvantages	• Thick • High fragility • Impossible to cut with scissors • Cannot be stored in lab notebook • High weight & consequent shipping costs • Large shelf space	• Low chemical resistance • Opaque	• Medium weight • Opaque • Heating stability up tp 175°C • Possible cracking of matrix due to high flexibility
Thickness *(approx.)*	2.0 - 2.5 mm	1.5 - 2.0 mm	1.5 - 2.0 mm
Total Weight	High	Low	Medium
Heating Stability	High	High	Below 175°C
Fragility	High	Low	Low
Cutting with Scissors	Impossible	Easily	Possible
Chemical Resistance	High	Low	High

Layer Thicknesses

The layer thickness is related to the nature of the analysis (*analytical or preparative*) as well as the performance of the plate (*TLC or HPLTC*). The most common layer thicknesses are:

- 150 - 200 µm (*HPTLC plates*)
- 200 - 250 µm (*analytical TLC plates*)
- 500 - 2,000 µm (*preparative TLC plates*)

Binder & UV Indicator

All standard Silia*Plate* products are made with a Gypsum binder and have an UV indicator (F_{254}). Contact us for custom products.

Sorbents

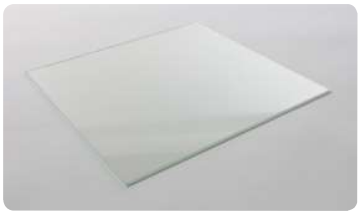
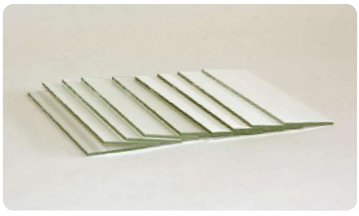
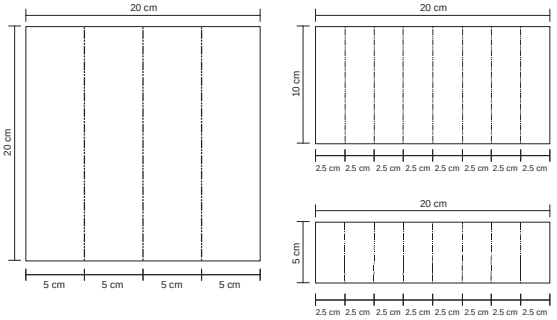
Available Sorbents		
Classical Silica Gel	**Reversed-Phases**	**Special Phases**
A universal matrix for daily, fast, reliable analysis of the largest spectra of molecules The particle size distribution used for the silica is related to the nature of the plate. For standard TLC, silica gel with a mean particle size of 10 - 14 µm is used compared to HPTLC, where a smaller particle size is required. In both cases, pore diameter is always 60 Å.	**The two most popular modes of separation employed in TLC are normal and reversed-phases.** In normal phase separation, the mobile phase is less polar than the stationary phase. Inversely, in reversed mode, the mobile phase (*usually a mixture of water and organic solvent*) is more polar than the stationary phase (*C18*). When satisfactory separations cannot be achieved by unmodified silica, other functionalized matrices have been designed for specific applications: C2, C8 and C18 phases are functionalization of silica performed using organosilanes of various chain lengths. Retention of molecules & ability to tolerate water in the moving phase are directly dependent on the chains length.	• Diol and Cyano (*CN*) are moderately polar. They can thus be suitable for both normal and reversed-phase chromatography, depending on your application. • Amino phases (NH_2) show weak anion exchange characteristics, great for charged compounds.

Matrices (*or Adsorbents*)

Various adsorbents can be used for TLC coating; silica, aluminum oxide, florisil, etc. For more than 20 years, SiliCycle has been offering a wide selection of TLC plates in various sizes (*plate size, thickness, backing*) and chemistries (*Silver Nitrate, CN, C18, NH_2*).
More than 80 % of all purifications are performed using silica gel as the adsorbent.

Available Matrices	
Silica Gel	**Aluminum Oxide**
Can be unmodified or functionalized, and suitable for a myriad of molecules of functionalities & polarities, such as aflatoxins, alkaloids, barbiturates, fatty acids, flavonoids, glycosides, lipids, nucleosides, proteins, pesticides, sweeteners, vitamins and so on.	Aluminum oxide (*commonly called Alumina*) is the second most commonly used matrix, and shows similar selectivity to that of silica, with 3 different pH ranges (*basic, neutral, acidic*). Popular applications include the separation for alkaloids, aliphatic compounds, aromatics, steroids, etc.

Plate Sizes

Available Sizes		
Standard TLC Plates	**Micro TLC Plates**	**Scored TLC Plates**
Silia*Plate* TLC plates are available in the following standard sizes depending on the coating used: • 20 x 20 cm • 10 x 20 cm • 5 x 20 cm • 5 x 10 cm • 10 x 10 cm Example: 	Also for your convenience, SiliCycle provides ready-to-use micro TLC plates in the following formats: • 2.5 x 10 cm • 2.5 x 7.5 cm • 2.5 x 5 cm Example: 	An interesting compromise between standard and micro plate sizes is our Scored Silia*Plate* (*glass backing*). Three different formats are available and possible cut combinations are shown in the image below. • 20 x 20 cm plates scored to four 5 x 20 cm plates (*or multiple of 5 cm width*) • 10 x 20 cm plates scored to eight 2.5 x 10 cm plates (*or multiple of 2.5 cm width*) • 5 x 20 cm plates scored to eight 2.5 x 5 cm plates (*or multiple of 2.5 cm width)* 

Glass-backed TLC Plates

Glass-backed Analytical TLC Plates					
PN	**Sorbent**	**Plate Size**	**Thickness**	**UV indicator**	**Qty/box**
Silica					
TLG-R10014B-124	Silica, Hard Layer	2.5 x 7.5 cm	250 µm	F_{254}	100
TLG-R10014B-424	Silica, Hard Layer	5 x 20 cm	250 µm	F_{254}	100
TLG-R10014B-323	Silica, Hard Layer	20 x 20 cm	250 µm	F_{254}	25
TLG-R10014B-323N	Silica, Hard Layer	20 x 20 cm	250 µm	None	25
TLGZ-R10011B-723	Silica with Preadsorbent Zone	10 x 20 cm	250 µm	F_{254}	25
TLGZ-R10011B-323	Silica with Preadsorbent Zone	20 x 20 cm	250 µm	F_{254}	25
TLG-R10014BK-417	Silica, optimized for $KMnO_4$ revelation	2.5 x 5 cm	250 µm	F_{254}	200
TLG-R10014BK-124	Silica, optimized for $KMnO_4$ revelation	2.5 x 7.5 cm	250 µm	F_{254}	100
TLG-R10014BK-527	Silica, optimized for $KMnO_4$ revelation	5 x 10 cm	250 µm	F_{254}	200
TLG-R10014BK-424	Silica, optimized for $KMnO_4$ revelation	5 x 20 cm	250 µm	F_{254}	100
TLG-R10014BK-725	Silica, optimized for $KMnO_4$ revelation	10 x 20 cm	250 µm	F_{254}	50
TLG-R10014BK-323	Silica, optimized for $KMnO_4$ revelation	20 x 20 cm	250 µm	F_{254}	25
TLG-R10014BK-323N	Silica, optimized for $KMnO_4$ revelation	20 x 20 cm	250 µm	None	25
TLG-R10014BKB-323	Silica, optimized for $KMnO_4$ revelation	20 x 20 cm	250 µm	F_{254}, F_{366}	25
Channeled with preadsorbent zone					
TLGCZ-R10011B-423	Silica	5 x 20 cm	250 µm	F_{254}	25
TLGCZ-R10011B-723	Silica	10 x 20 cm	250 µm	F_{254}	25
TLGCZ-R10011B-323	Silica	20 x 20 cm	250 µm	F_{254}	25
TLGCZ-R10011B-323N	Silica	20 x 20 cm	250 µm	None	25
Scored TLC plates					
TLGSR10011B-423	Silica	5 x 20 cm, scored to 2.5 x 5 cm	250 µm	F_{254}	25
TLGSR10011B-424	Silica	5 x 20 cm, scored to 2.5 x 5 cm	250 µm	F_{254}	100
TLGSR10011B-723	Silica	10 x 20 cm, scored to 2.5 x 10 cm	250 µm	F_{254}	25
TLGSR10011B-323	Silica	20 x 20 cm, scored to 5 x 20 cm	250 µm	F_{254}	25
Functionalized silica & other adsorbents					
TLG-AUT0014-423	Florisil	5 x 20 cm	250 µm	F_{254}	25
TLG-AUT0014-723	Florisil	10 x 20 cm	250 µm	F_{254}	25
TLG-AUT0014-323	Florisil	20 x 20 cm	250 µm	F_{254}	25
TLG-AUT0337-323B	Basic Alumina	20 x 20 cm	250 µm	F_{254}	25
TLG-AUT0337B-424N	Neutral Alumina	5 x 20 cm	250 µm	F_{254}	100
TLG-AUT0337-323N	Neutral Alumina	20 x 20 cm	250 µm	F_{254}	25
TLG-AUT0337-323NF	Neutral Alumina	20 x 20 cm	250 µm	None	25
TLG-AUT0337B-323N	Neutral Alumina	20 x 20 cm	250 µm	F_{254}	25

Glass-backed HPTLC Plates

Glass-backed Analytical HPTLC Plates					
PN	**Sorbent**	**Plate Size**	**Thickness**	**UV indicator**	**Qty/box**
Silica					
HPTLG-R10011B-1010	Silica	10 x 10 cm	150 µm	F_{254}	25
HPTLG-R10011B-2020	Silica	20 x 20 cm	150 µm	F_{254}	25
HPTLG-R10014BK-1010	Silica, optimized for $KMnO_4$ revelation	10 x 10 cm	150 µm	F_{254}	25
HPTLG-R10014BK-1020	Silica, optimized for $KMnO_4$ revelation	10 x 20 cm	150 µm	F_{254}	25
HPTLG-R10014BK-2020	Silica, optimized for $KMnO_4$ revelation	20 x 20 cm	150 µm	F_{254}	25
HPTLGSR10011B-1010	Silica	10 x 10 cm, scored to 5 x 5 cm	150 µm	F_{254}	25
HPTLGSR10011B-1020	Silica	10 x 20 cm, scored to 2.5 x 10 cm	150 µm	F_{254}	25
HPTLGZ-R10011B-203	Silica with Preadsorbent Zone	10 x 10 cm	150 µm	F_{254}	25
HPTLGZ-R10011B-703	Silica with Preadsorbent Zone	10 x 20 cm	150 µm	F_{254}	25
Functionalized silica & other adsorbents					
TLG-R30314BK-213	C18 (*100 %*), optimized for $KMnO_4$ revelation	10 x 10 cm	150 µm	F_{254}	25
TLG-R30314BK-213N	C18 (*100 %*), optimized for $KMnO_4$ revelation	10 x 10 cm	150 µm	None	25
TLG-R30411B-213	C18 (*13 %*)	10 x 10 cm	150 µm	F_{254}	25
TLG-R30411B-303	C18 (*13 %*)	20 x 20 cm	150 µm	F_{254}	25
TLG-R30414B-313	C18 (*13 %*)	20 x 20 cm	200 µm	F_{254}	25
TLG-R30411B-323	C18 (*13 %*)	20 x 20 cm	250 µm	F_{254}	25
TLG-R30414BK-213	C18 (*13 %*), optimized for $KMnO_4$ revelation	10 x 10 cm	200 µm	F_{254}	25
TLG-R30414BK-313	C18 (*13 %*), optimized for $KMnO_4$ revelation	20 x 20 cm	200 µm	F_{254}	25
TLG-R31011B-203	C8	10 x 10 cm	150 µm	F_{254}	25
TLG-R31011B-303	C8	20 x 20 cm	150 µm	F_{254}	25
TLG-R32611B-203	C2	10 x 10 cm	150 µm	F_{254}	25
TLG-R32611B-303	C2	20 x 20 cm	150 µm	F_{254}	25
TLG-R32614BK-313	C2, optimized for $KMnO_4$ revelation	20 x 20 cm	200 µm	F_{254}	25
TLG-R32614BK-713	C2, optimized for $KMnO_4$ revelation	10 x 20 cm	200 µm	F_{254}	25
TLG-R35011B-713	Diol	10 x 20 cm	200 µm	F_{254}	25
TLG-R35014BK-213	Diol, optimized for $KMnO_4$ revelation	10 x 10 cm	200 µm	F_{254}	25
TLG-R35014BK-713	Diol, optimized for $KMnO_4$ revelation	10 x 20 cm	200 µm	F_{254}	25
TLG-R35014BK-313	Diol, optimized for $KMnO_4$ revelation	20 x 20 cm	200 µm	F_{254}	25
TLG-R38011B-203	Cyano (*CN*)	10 x 10 cm	150 µm	F_{254}	25
TLG-R38011B-723	Cyano (*CN*)	10 x 20 cm	150 µm	F_{254}	25
TLG-R38011B-303	Cyano (*CN*)	20 x 20 cm	150 µm	F_{254}	25
TLG-R38014BK-213	Cyano (*CN*), optimized for $KMnO_4$ revelation	10 x 10 cm	200 µm	F_{254}	25
TLG-R38014BK-713	Cyano (*CN*), optimized for $KMnO_4$ revelation	10 x 20 cm	200 µm	F_{254}	25
TLG-R38014BK-313	Cyano (*CN*), optimized for $KMnO_4$ revelation	20 x 20 cm	200 µm	F_{254}	25
TLG-R52011B-203	Amine (NH_2)	10 x 10 cm	150 µm	F_{254}	25
TLG-R52011B-723	Amine (NH_2)	10 x 20 cm	150 µm	F_{254}	25
TLG-R52011B-303	Amine (NH_2)	20 x 20 cm	150 µm	F_{254}	25
TLG-R52014BK-213	Amine (NH_2), optimized for $KMnO_4$ revelation	10 x 10 cm	200 µm	F_{254}	25
TLG-R52014BK-713	Amine (NH_2), optimized for $KMnO_4$ revelation	10 x 20 cm	200 µm	F_{254}	25
TLG-R52014BK-313	Amine (NH_2), optimized for $KMnO_4$ revelation	20 x 20 cm	200 µm	F_{254}	25
TLG-R23511B-423	$AgNO_3$ (*10 %*)	5 x 20 cm	250 µm	F_{254}	25
TLG-R23511B-303	$AgNO_3$ (*10 %*)	20 x 20 cm	250 µm	F_{254}	25
TLG-R23611B-423	$AgNO_3$ (*15 %*)	5 x 20 cm	250 µm	F_{254}	25
TLG-R23611B-323	$AgNO_3$ (*15 %*)	20 x 20 cm	250 µm	F_{254}	25
TLG-R23711B-423	$AgNO_3$ (*20 %*)	5 x 20 cm	250 µm	F_{254}	25
TLG-R23711B-323	$AgNO_3$ (*20 %*)	20 x 20 cm	250 µm	F_{254}	25
TLG-R23M11B-323	$AgNO_3$ (*5-10-15-20%, 5 TLC each*)	5 x 20 cm	250 µm	F_{254}	5 x 4
TLGSR1234511B-723	Trial Packing of Functionalized Silica	10 x 20 cm, scored to 2.5 x 10 cm	150 µm	F_{254}	25
TLG-AUT0308-203	RP Silanized	10 x 10 cm	150 µm	F_{254}	25

Glass-backed Preparative TLC Plates

Glass-backed Preparative TLC Plates					
PN	**Sorbent**	**Plate Size**	**Thickness**	**UV indicator**	**Qty/box**
Silica					
TLG-R10011B-333	Silica	20 x 20 cm	500 µm	F_{254}	25
TLG-R10011B-341	Silica	20 x 20 cm	1,000 µm	F_{254}	25
TLG-R10011B-363	Silica	20 x 20 cm	1,500 µm	F_{254}	25
TLG-R10011B-353	Silica	20 x 20 cm	2,000 µm	F_{254}	25
Functionalized silica & other adsorbents					
TLG-AUT0337-343N	Neutral Alumina	20 x 20 cm	1,000 µm	F_{254}	25
TLG-AUT0337-343NF	Neutral Alumina	20 x 20 cm	1,000 µm	None	25
TLG-AUT0337-443	Neutral Alumina	5 x 20 cm	1,000 µm	F_{254}	25
TLG-AUT0337-443F	Neutral Alumina	5 x 20 cm	1,000 µm	None	25
TLG-AUT0337B-341N	Neutral Alumina	20 x 20 cm	1,000 µm	None	15
TLG-R23511B-433	$AgNO_3$ (*10 %*)	5 x 20 cm	500 µm	F_{254}	25
TLG-R23511B-333	$AgNO_3$ (*10 %*)	20 x 20 cm	500 µm	F_{254}	25
TLG-R23611B-433	$AgNO_3$ (*15 %*)	5 x 20 cm	500 µm	F_{254}	25
TLG-R23611B-333	$AgNO_3$ (*15 %*)	20 x 20 cm	500 µm	F_{254}	25
TLG-R23711B-433	$AgNO_3$ (*20 %*)	5 x 20 cm	500 µm	F_{254}	25
TLG-R23711B-333	$AgNO_3$ (*20 %*)	20 x 20 cm	500 µm	F_{254}	25
TLG-R30411B-341	C18 (*13 %*)	20 x 20 cm	1,000 µm	F_{254}	15
TLG-R30414BK-341	C18 (*15 %*), optimized for $KMnO_4$ revelation	20 x 20 cm	1,000 µm	F_{254}	15
Scored preparative TLC plates					
TLGSR10011B-333	Silica	20 x 20 cm, scored to 5 x 20 cm	500 µm	F_{254}	25
TLGSR10011B-341	Silica	20 x 20 cm, scored to 5 x 20 cm	1,000 µm	F_{254}	25
TLGSR10011B-353	Silica	20 x 20 cm, scored to 5 x 20 cm	2,000 µm	F_{254}	25

Aluminum-backed TLC Plates

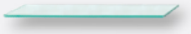
Aluminum-backed Analytical TLC Plates					
PN	**Sorbent**	**Plate Size**	**Thickness**	**UV indicator**	**Qty/box**
Silica					
TLA-R10011B-005	Silica	4 x 8 cm	150 µm	F_{254}	50
TLA-R10011B-124	Silica	2.5 x 7.5 cm	200 µm	F_{254}	200
TLA-R10011B-323	Silica	20 x 20 cm	200 µm	F_{254}	25
TLA-R10011B-323N	Silica	20 x 20 cm	200 µm	None	25
TLA-R10011B-415	Silica	5 x 20 cm	200 µm	F_{254}	50
TLA-R10011B-515	Silica	5 x 10 cm	200 µm	F_{254}	50
TLA-R10011B-712	Silica	10 x 20 cm	200 µm	F_{254}	20
TLA-R10014BK-1112	Silica, optimized for $KMnO_4$ revelation	5 x 7.5 cm	200 µm	F_{254}	20
Functionalized silica & other adsorbents					
TLA-AUT0337-323N	Neutral Alumina	20 x 20 cm	200 µm	F_{254}	25
TLA-AUT0337-323NF	Neutral Alumina	20 x 20 cm	200 µm	None	25
TLA-R30411B-005	Silica C18 (*13 %*)	4 x 8 cm	150 µm	F_{254}	50
TLA-R30411B-303	Silica C18 (*13 %*)	20 x 20 cm	150 µm	F_{254}	25
TLA-R30411B-405	Silica C18 (*13 %*)	5 x 20 cm	150 µm	F_{254}	50
TLA-R30411B-505	Silica C18 (*13 %*)	5 x 10 cm	150 µm	F_{254}	50
TLA-R30414BK-303	Silica C18 (*13 %*), opt. for $KMnO_4$ revelation	20 x 20 cm	150 µm	F_{254}	25
TLA-R52014BK-005	Amine (NH_2), optimized for $KMnO_4$ revelation	4 x 8 cm	150 µm	F_{254}	50

Aluminum-backed Analytical HPTLC Plates					
PN	**Sorbent**	**Plate Size**	**Thickness**	**UV indicator**	**Qty/box**
Silica					
HPTLA-R10011B-323	Silica	20 x 20 cm	150 µm	F_{254}	25
HPTLA-R10011B-323N	Silica	20 x 20 cm	150 µm	None	25

Plastic-backed TLC Plates

Plastic-backed Analytical TLC Plates					
PN	**Sorbent**	**Plate Size**	**Thickness**	**UV indicator**	**Qty/box**
Silica					
TLP-R10011B-005N	Silica	4 x 8 cm	150 µm	None	50
TLP-R10011B-117	Silica	2.5 x 7.5 cm	200 µm	F_{254}	200
TLP-R10011B-323	Silica	20 x 20 cm	200 µm	F_{254}	25
TLP-R10011B-323N	Silica	20 x 20 cm	200 µm	None	25
TLP-R10014B-0115	Silica	5 x 6.7 cm	200 µm	F_{254}	50
TLP-R10014BK-0115	Silica, optimized for $KMnO_4$ revelation	5 x 6.7 cm	200 µm	F_{254}	50
TLP-R10014BK-0116	Silica, optimized for $KMnO_4$ revelation	3.3 x 6.6 cm	200 µm	F_{254}	50
Other adsorbents					
TLP-R83014BK-303	Polyamide-6, optimized for $KMnO_4$ revelation	20 x 20 cm	100 µm	F_{254}	25
TLP-R83014BK-405	Polyamide-6, optimized for $KMnO_4$ revelation	5 x 20 cm	100 µm	F_{254}	50
TLP-R83014BK-405N	Polyamide-6, optimized for $KMnO_4$ revelation	5 x 20 cm	100 µm	None	50
TLP-R83014BK-303N	Polyamide-6, optimized for $KMnO_4$ revelation	20 x 20 cm	100 µm	None	25

TLC Accessories

TLC Accessories		
PN	**Accessory**	**Qty/box**
AUT-0161	Rectangular TLC Developing Chamber 	1
AUT-0161B	Replacement Lid for Rectangular Developing Chamber 	1
AUT-0162	TLC Adsorbent Scraper 	1
AUT-0163	TLC Spotting Capillaries	300
AUT-0182	TLC Plate (*20 x 20 cm*) Cutter 	1
AUT-0183	Replacement Scriber for TLC Plate Cutter 	1
AUT-1182	TLC Plate Pencil Glass Cutter 	1

TLC Visualization Methods

Described below are the most frequently used TLC visualization methods (*also called stains*) in alphabetical order.

N.B. Shaded lines refer to ”Universal stains“ ; “BG” stands for “background”.

Stains for Thin Layer Chromatography			
Name	**Visualization of...**	**Stain Recipe**	**Comments**
p-Anisaldehyde #1	**Universal stain** Good for nucleophiles and oxygenated compounds	**Prepare stain as follows** • 2 mL of glacial acetic acid • 5 mL of p-anisaldehyde • 7 mL of conc. sulfuric acid • 185 mL of 95 % ethanol **Tip:** add dropwise the acid at the end and stir vigorously.	**Visualization Colors** • Spots: Various colors • BG: Orange to pink **Appropriate Storage** • Aluminum wrapped at 0°C
Note: Tends to be insensitive to alkenes, alkynes and aromatic compounds unless other functional groups are present.			
p-Anisaldehyde #2	Acronycine Cineoles Terpenes	**Prepare stain as follows [*1:10:20:80*]** • p-anisaldehyde • perchloric acid • acetone • water	**Visualization Colors** • Spots: Various colors • BG: Orange to pink **Appropriate Storage** • Aluminum wrapped at 0°C
Bromocresol Green	Acidic groups ($pK_a < 5$) Carboxylic acids	**Prepare stain as follows** • 0.04 g of bromocresol green • 100 mL of 95 % ethanol • 0.1 M solution of sodium hydroxide **Tip**: add the base slowly at the end until the solution turns pale blue.	**Visualization Colors** • Spots: Yellow to green • BG: Blue **Appropriate Storage** • Aluminum wrapped at 0°C ***Heating NOT required***
Cerium Molybdate (*CAM or Hanessian's Stain*)	**Universal stain** Good for peptides	**Prepare stain as follows** • 12 g of ammonium molybdate • 0.5 g of ceric ammonium molybdate • 15 mL of conc. sulfuric acid • 235 mL of water	**Visualization Colors** • Spots: Blue • BG: White **Appropriate Storage** • Aluminum wrapped
Note: Highly sensitive stain; very low concentration of product may appear as a significant impurity.			
Cerium Sulfate ($Ce(SO_4)_2$)	**Difficultly stainable compounds**	**Prepare stain as follows** • 15 % aqueous sulfuric acid saturated with ceric sulfate	**Visualization Colors** • Spots: Black • BG: Yellow to white
Chromic Acid	**Difficultly stainable compounds**	**Prepare stain as follows** • 2.5 g of potassium chromate • 100 mL of 20 % sulfuric acid in water	
Cobalt Chloride ($CoCl_2$)	**Universal stain** Used in conjunction with PMA when this one is not effective enough	**Prepare stain as follows** • 2 g of cobalt chloride • 100 mL of water • 10 mL of conc. sulfuric acid **Tip**: simply dip PMA treated plate in $CoCl_2$ solution.	**Visualization Colors** • Spots: Various colors • BG: Pink ***Heating NOT required***
p-Dimethylamino-benzaldehyde (*PDAB or Ehrlich's Reagent*)	Amines Indoles	**Prepare stain as follows** • 0.5 g of p-dimethylamino-benzaldehyde • 10 mL of conc. hydrochloric acid • 40 mL of acetone *(or 95 % ethanol)*	**Visualization Colors** • Spots: Blue • BG: White

Stains for Thin Layer Chromatography

Name	Visualization of...	Stain Recipe	Comments
2,4-Dinitrophenyl-hydrazine (*DNP*)	Aldehydes Ketones	**Prepare stain as follows** • 12 g of 2,4-dinitrophenylhydrazine • 60 mL of conc. sulfuric acid • 80 mL of water • 200 mL of 95 % ethanol	**Visualization Colors** • Spots: Yellow to red • BG: Light orange ***DO NOT HEAT dipped plate***
Dragendorff Reagent	**Nitrogenous Compounds** Alkaloids, amines, organics bases, etc. **Phenols**	**Prepare stain as follows:** **Solution A** • 1.7 g of bismuth nitrate • 80 mL of water • 20 mL of acetic acid **Solution B** • 40 g of potassium iodide • 100 mL of water **Tip:** mix 5 mL of each solution A and B to a solution of 20 mL of acetic acid in 70 mL of water.	**Visualization Colors** • Spots: Orange to red • BG: Yellow **Appropriate Storage** • Aluminum wrapped **Stain Shelf-Life** • One or two weeks • Solutions A and B are long term storable ***DO NOT HEAT dipped plate***
Ferric Chloride ($FeCl_3$)	Phenols	**Prepare stain as follows** • 2 g of ferric chloride • 102 mL of 0.5 N hydrochloric acid	**Visualization Colors** • Spots: Red • BG: Yellow
Iodine	Unsaturated & Aromatic compounds	**Prepare stain as follows** • Iodine crystals in an amber bottle	**Visualization Colors** • Spots: Dark brown • BG: Light brown
Note: Iodine stain can be removed by heating.			
Morin Hydrate (*Hydroxy Flavone*)	**Universal stain** Fluorescently active	**Prepare stain as follows** • 0.1 % of morin hydrate in methanol	**Visualization Colors** • Spots: Various colors • BG: White
Ninhydrin (*Indanetrione Hydrate*)	Amino acids Amino sugars Amines	**Prepare stain as follows** • 1.5 g of ninhydrin • 3 mL acetic acid • 100 mL of n-butanol	**Visualization Colors** • Spots: Various colors • BG: White
Phosphomolybdic Acid (*PMA*)	**Universal stain** Very effective against diluted sample	**Prepare stain as follows** • 10 % of PMA solution in ethanol • or 10 g of PMA in 100 mL of ethanol	**Visualization Colors** • Spots: Dark green to black • BG: Light green
Potassium Permanganate ($KMnO_4$)	Olefins Readily oxidized groups Alcohols, aldehydes, alkenes, alkynes, etc.	**Prepare stain as follows** • 1.5 g of potassium permanganate • 10 g of potassium carbonate • 1.25 mL of 10 % sodium hydroxide • 200 mL of water	**Visualization Colors** • Spots: Yellow to light brown • BG: Purple to pink **Stain Shelf-Life** • Three months
Note: Can be used for detection of alcohols, amines, sulfides and mercaptans groups when gently heated.			
Vanillin	**Universal stain** Very effective for same polarity products *(Rf)*	**Prepare stain as follows** • 15 g of vanillin • 250 mL of 95 % ethanol • 2.5 mL of conc. sulfuric acid	**Visualization Colors** • Spots: Various colors • BG: Light tan

Note: Occasionally, spots can be seen more clearly from glass side with glass backed TLC plate.
Otherwise mentioned, stains are long-term stable when stored in a tightly-closed container to prevent solvent evaporation.

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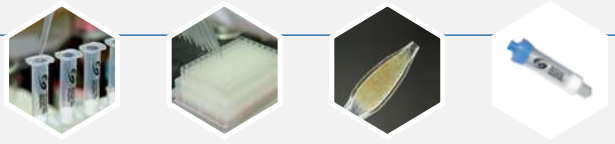

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