

# Future perspectives of TLC; The dominant marked leader steps ahead

HPTLC Symposium in Basel 2011

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July 6-8, 2011

# Production Plant



... the biggest chromatographic silica gel plant in the world,



# Production Plant

Four reactors for silica gel production,



... Large scale production,  
batch size: several tons

# Silica Production Process

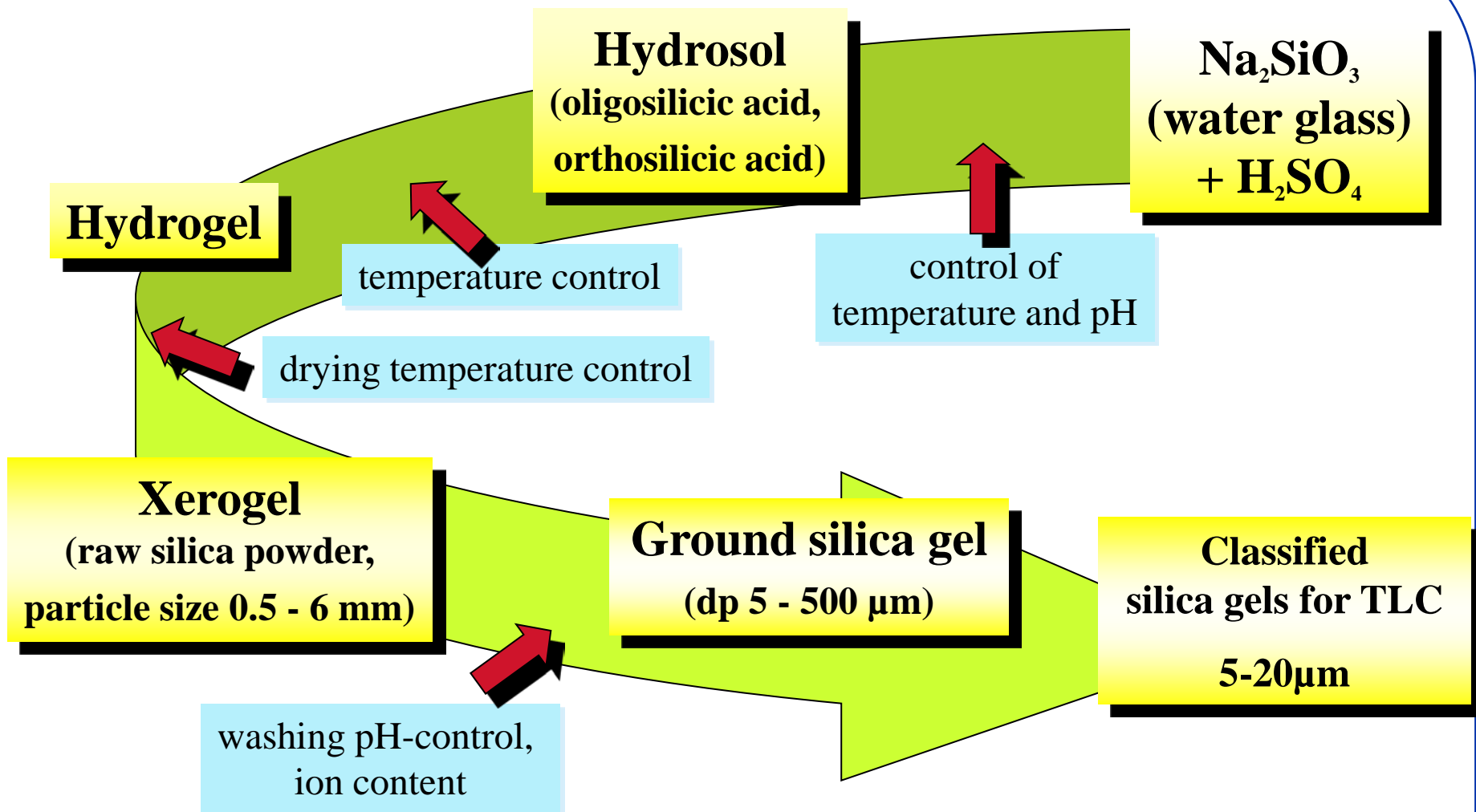
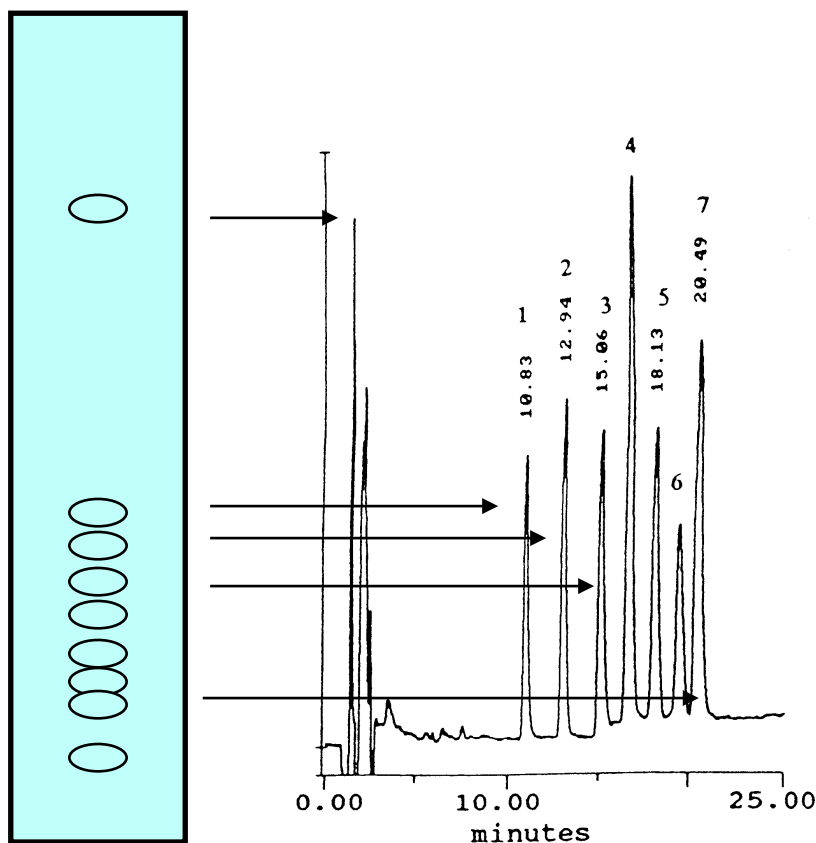


Fig. 1: TLC separation (left) and the corresponding HPLC separation (right)



## HPLC and TLC

- Separations occur by the same retention mechanism
- Differences arise from:
  - Stationary phase format
  - Development mode vs. elution
  - Disposable stationary phase (TLC)
  - Detection in the presence of the stationary phase (TLC)
  - Kinetic performance



# Merck

## Pioneered Thin Layer Chromatography



- 1938  $\text{Al}_2\text{O}_3$  layers (Izmailov and Shraiber)
- 1951 Silica gel layers with calcium sulphate (Kirchner)
- 1950 Egon Stahl is founder of thin layer Chrom. and standardized silica gels (Higher sensitivity more and universal scope of applications)
- 1958 Merck launched TLC during Achema exhibition
- 1966 Pre-coated TLC plates
- 1975 Pre-coated HPTLC plates
- 1978 Modified sorbents for TLC and HPTLC
- 1995 Spherical sorbents for HPTLC (LiChrospher<sup>®</sup>)
- 2002 Ultra thin monolithic silica plates (UTLC)
- 2003 LuxPlate<sup>®</sup>
- 2006 **ProteoChrom<sup>®</sup> Plates**



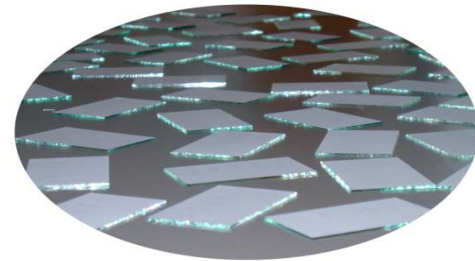
First presentation of pre-coated plates, Achema 1958

# TLC Production Today

- 23 employees in production plant
- > 7 million plates per year
- **Every single plate is visually inspected**
- More than 60 different products

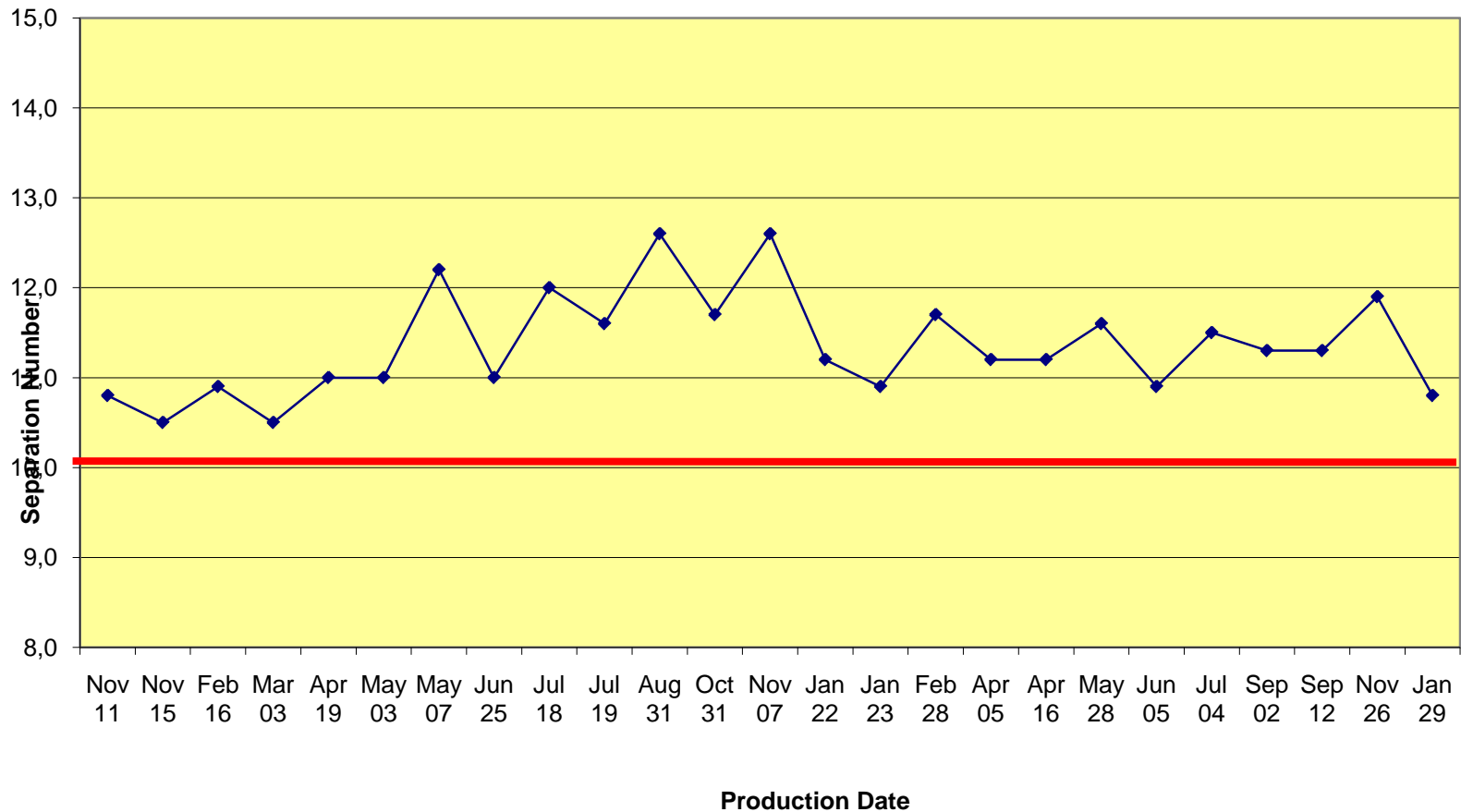


**On these plates 45 million analyses are carried out each year!**



# Batch to batch reproducibility of separation number

Item no 105642 HPTLC silica gel 60 F254 50 glass plates 20\*10cm



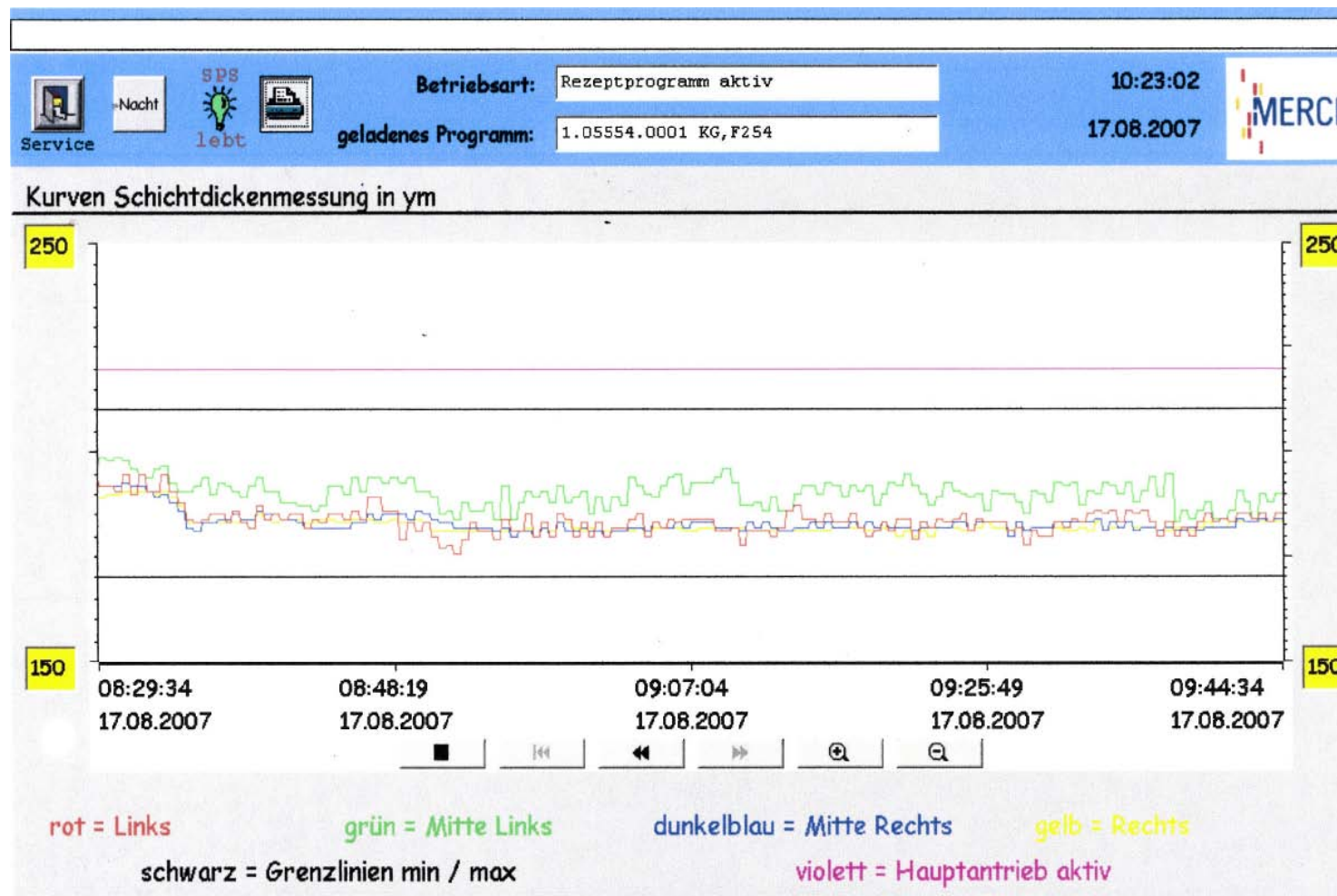


An example for the further optimization of the production of TLC aluminium sheets:

**LASER** sensors are used for the continuous in-line control of **the layer thickness**



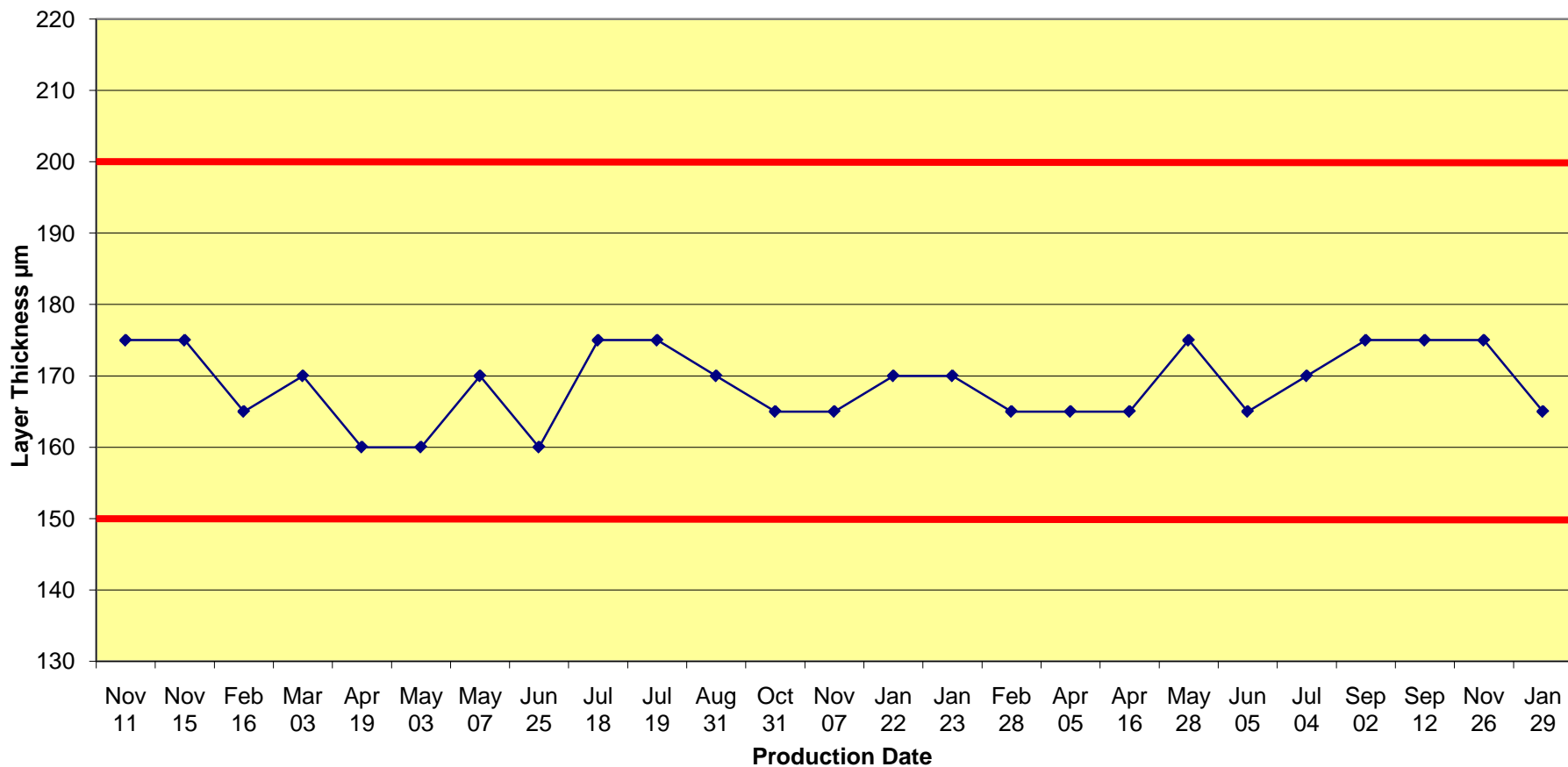
# Graphical view of the thickness values over 75 minutes of production



# Batch to batch reproducibility of layer thickness

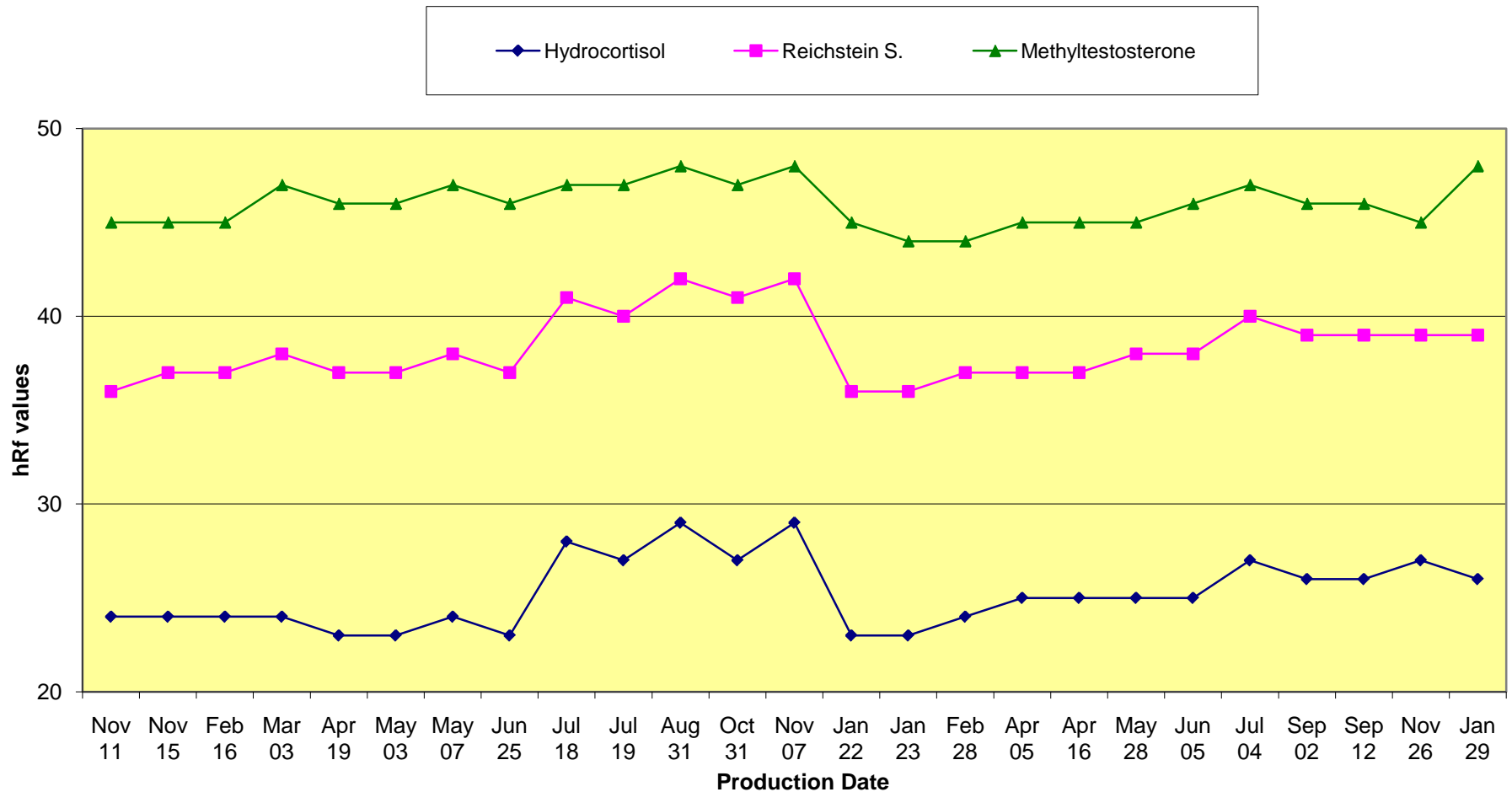


Item no 105642 HPTLC silica gel 60 F254 50 glass plates 20\*10cm



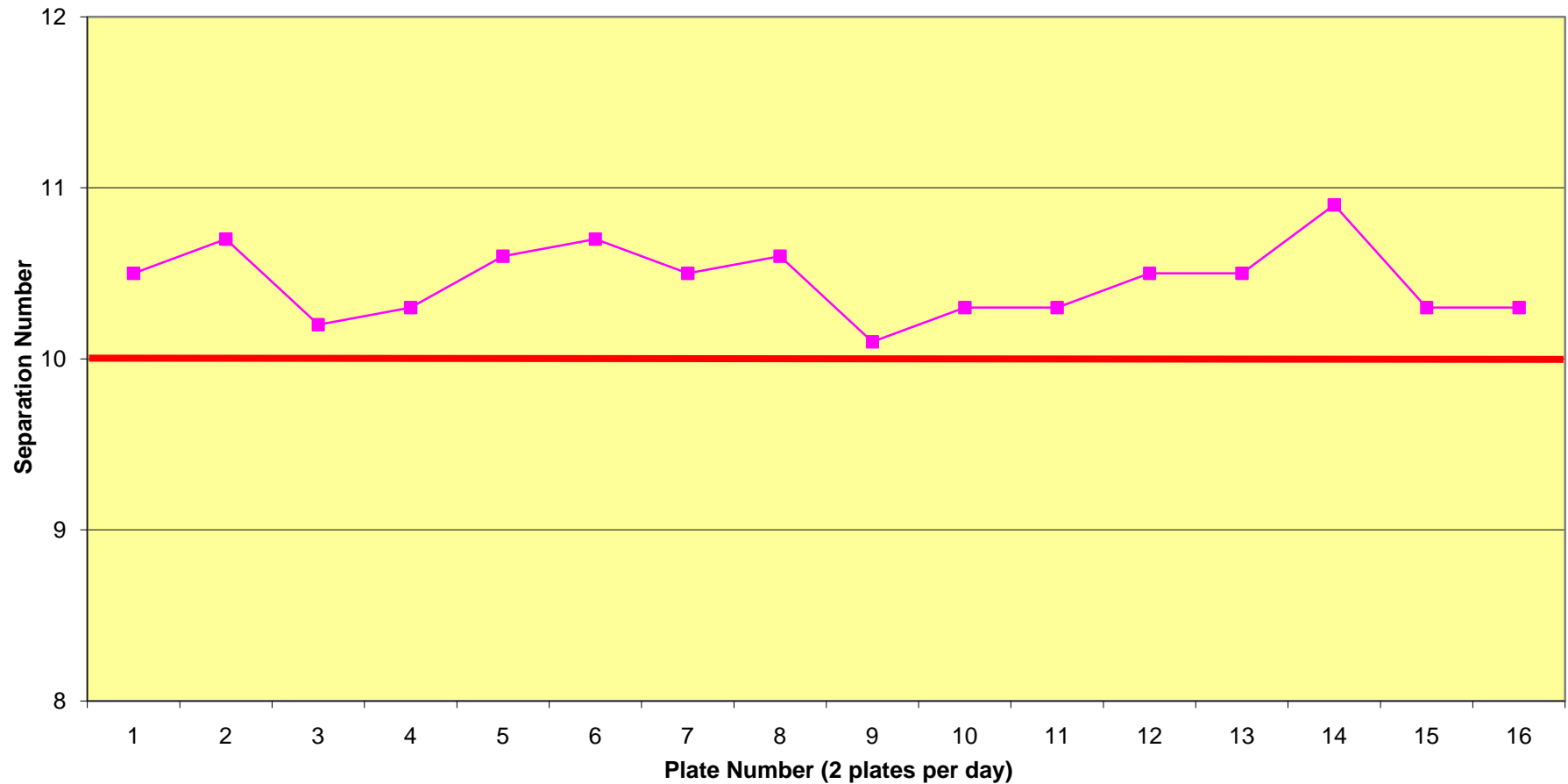
# Batch to batch reproducibility of hRf values Steroids

Item no 105642 HPTLC silica gel 60 F254 50 glass plates 20\*10cm



# Reproducibility within one batch of separation number ( dye test)

Item no 105642 HPTLC silica gel 60 F254 50 glass plates 20\*10cm





# Sorbens Types

## TLC

**Silica gel 60**

Al<sub>2</sub>O<sub>3</sub> 60/150

Cellulose

(Kieselguhr)

RP-2

RP-8

RP-18

NH<sub>2</sub>

## HPTLC

**Silica gel 60**

Al<sub>2</sub>O<sub>3</sub> 60/150

Cellulose

RP-2

RP-8

RP-18

**RP-18W**

NH<sub>2</sub>

CN

DIOL

## PLC

**Silica gel 60**

RP18



# TLC Quality Grades

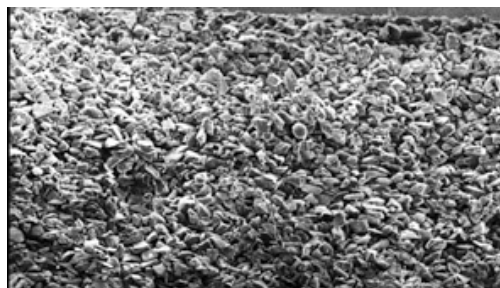
## Silica gel 60 types

### Particle size distribution:

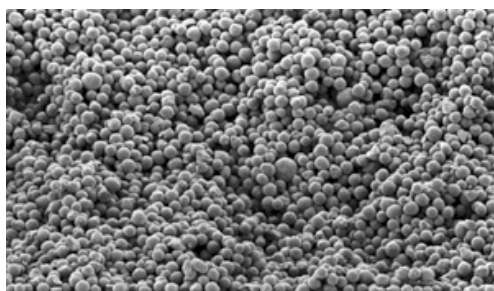
- Classical TLC  
5 - 20  $\mu\text{m}$



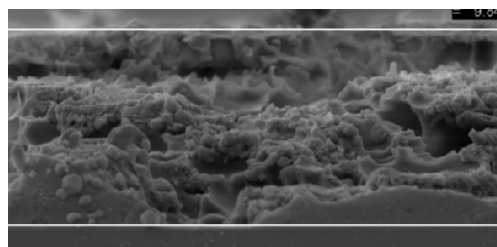
- HPTLC  
4 - 8  $\mu\text{m}$



- **Spherical** particles HPTLC  
4 - 8  $\mu\text{m}$



- Monolithic layer UTLC



**Not comparable**

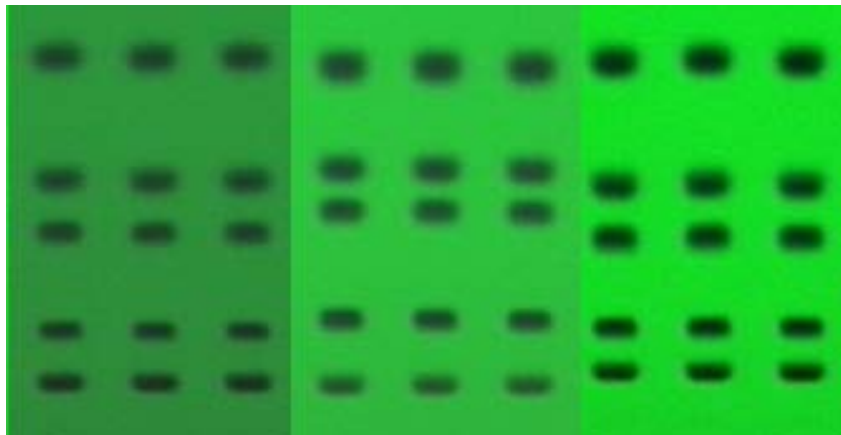
# Special Product - LuxPlate®

- Higher content of fluorescent indicator for better contrast against background
- Highly robust, due to higher content of binder
- Comparable retention behaviour

Cassical  
silica 60 F<sub>254</sub>

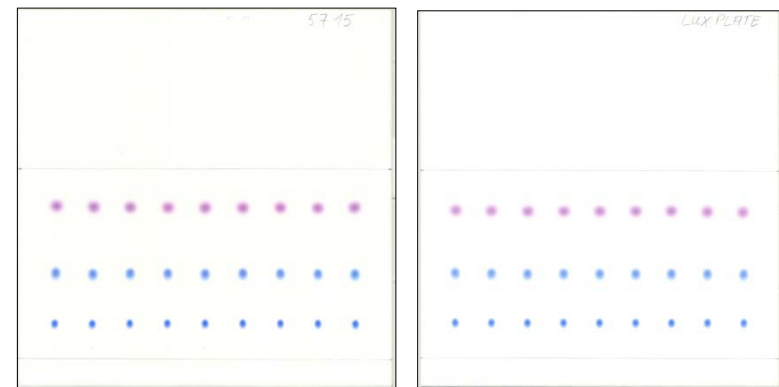
Competitor

LuxPlate®

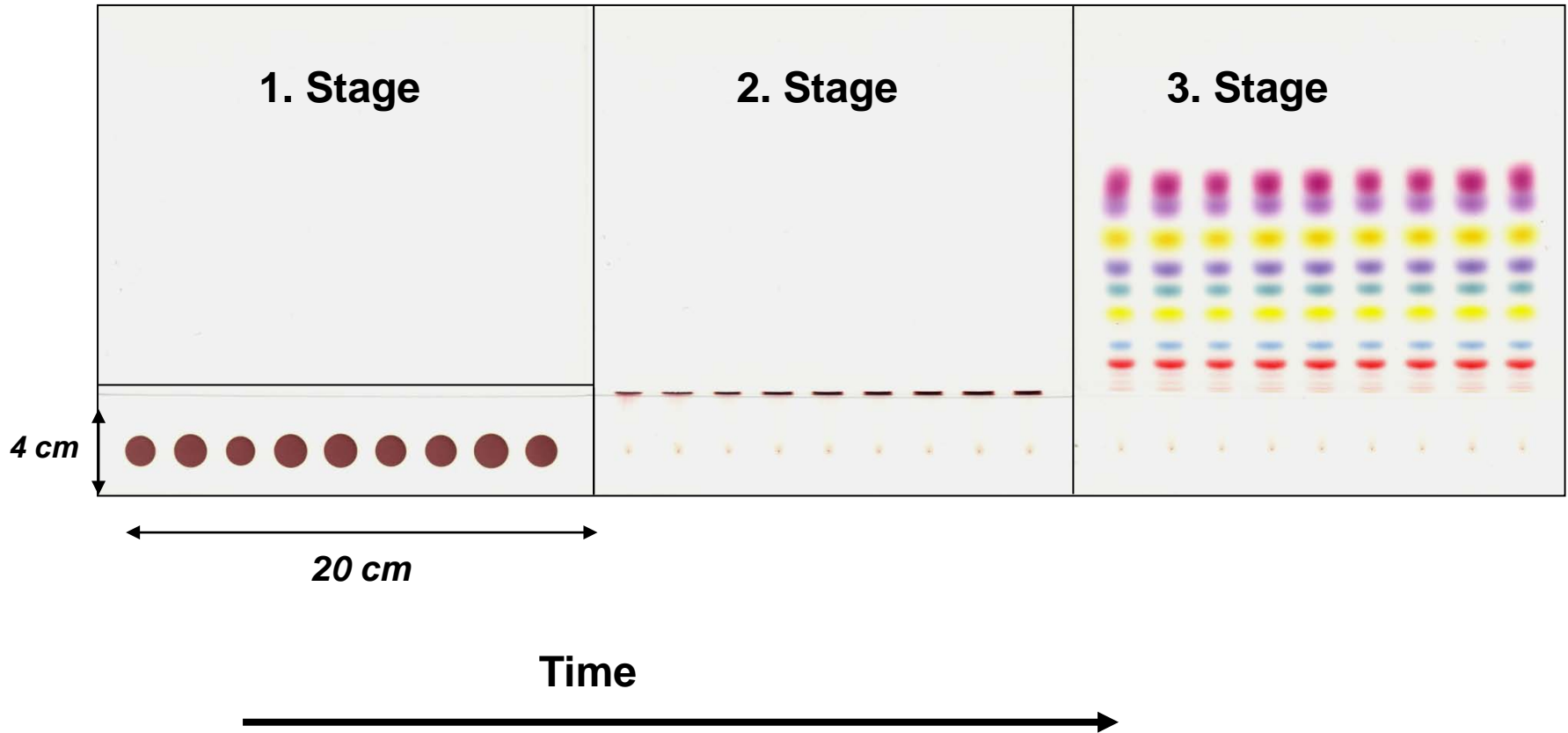


LuxPlate®

Classical  
silica 60 F<sub>254</sub>



# Special Product Concentrating Zone Plates



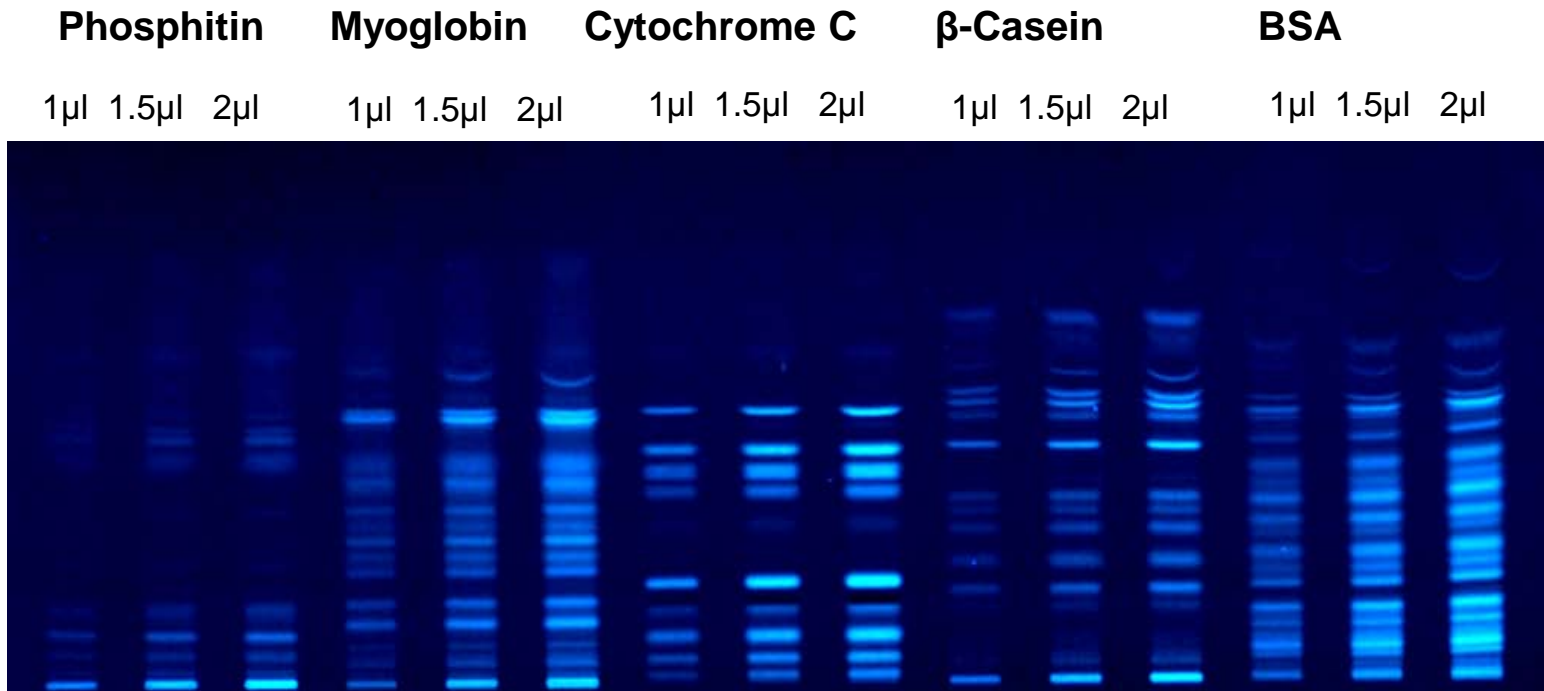
# New Products

## HPTLC Plates for Peptide Analysis

ProteoChrom®	Sorbent	Format	Layer	Backing	Special
1.05650 HPTLC <b>Silica gel</b> F <sub>254s</sub>	High Performance Silica gel	20 x 10	100 µm	glass	Special binder
1.05651 HPTLC <b>Cellulose</b>	High performance Cellulose	10 x 10	100 µm	aluminium	High density layer

Why plates for analysis of protein digests & peptides?

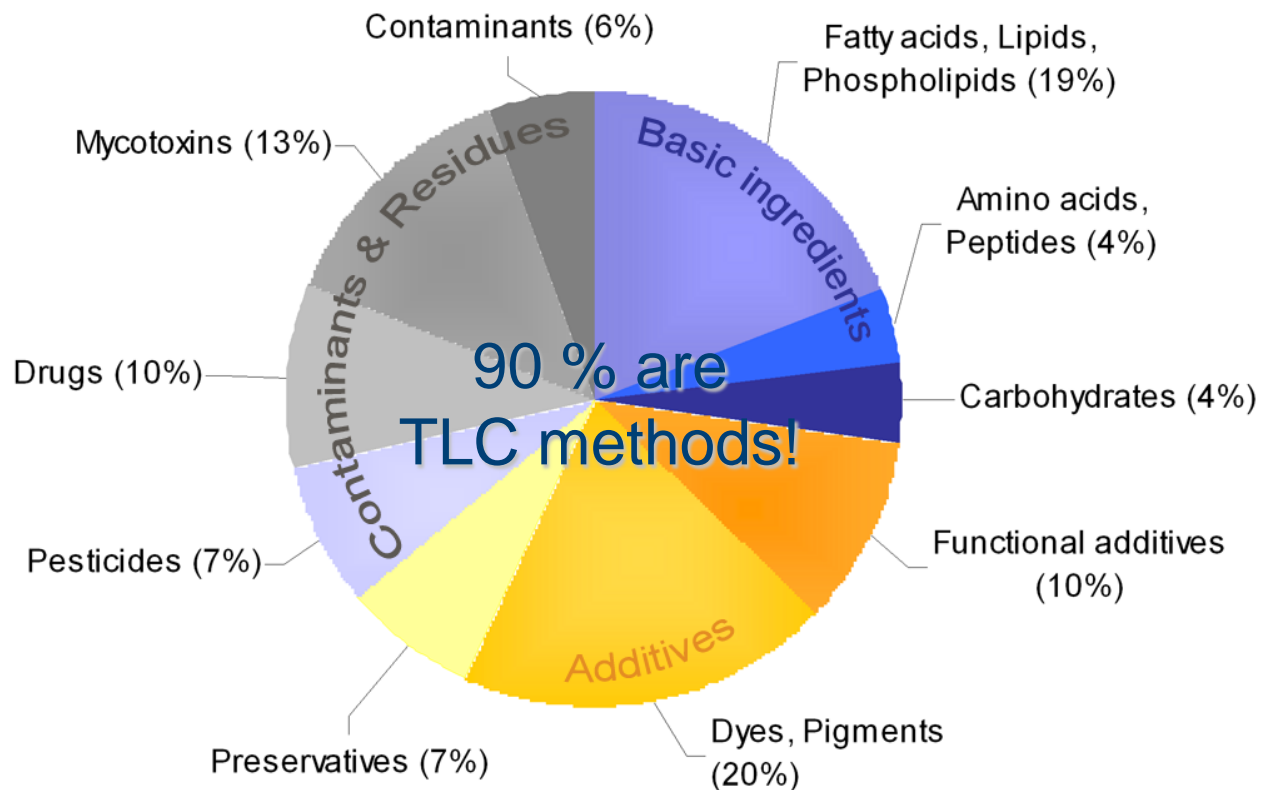
# ProteoChrom® Features



- Extra thin, extra smooth
- Robust, highly stable in water
- Include easy to follow, optimized protocols

# Planar Chromatography

## Food analysis 1987-2007



G. Morlock, W. Schwack, J Planar Chromatogr 20 (2007) 399-407



# TLC MS Coupling

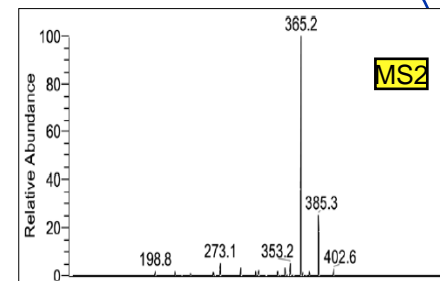
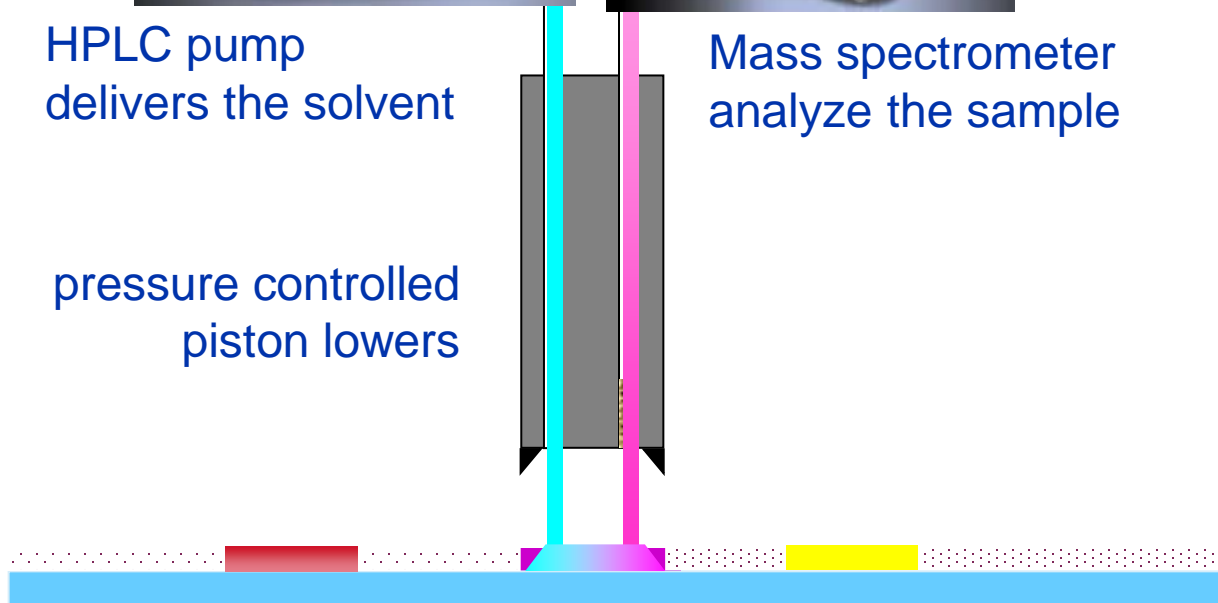


HPLC pump  
delivers the solvent



Mass spectrometer  
analyze the sample

pressure controlled  
piston lowers



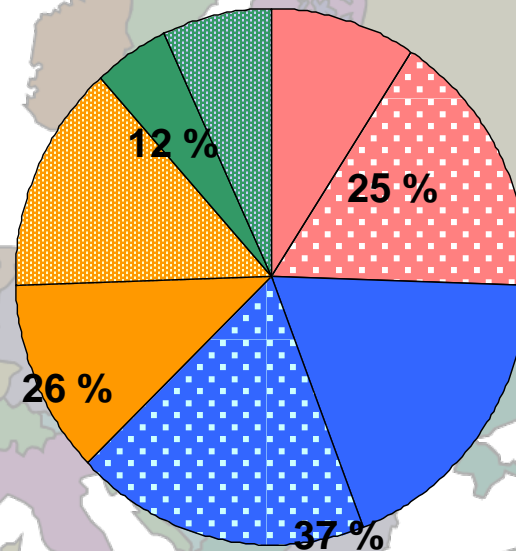
TLC/HPTLC plate with spots / zones

**Merck is market leader  
in a mature market**

# Market Thin Layer Chromatography

Total 40 – 50 Mio EUR  
AGR: 2 - 4%

World market 2007

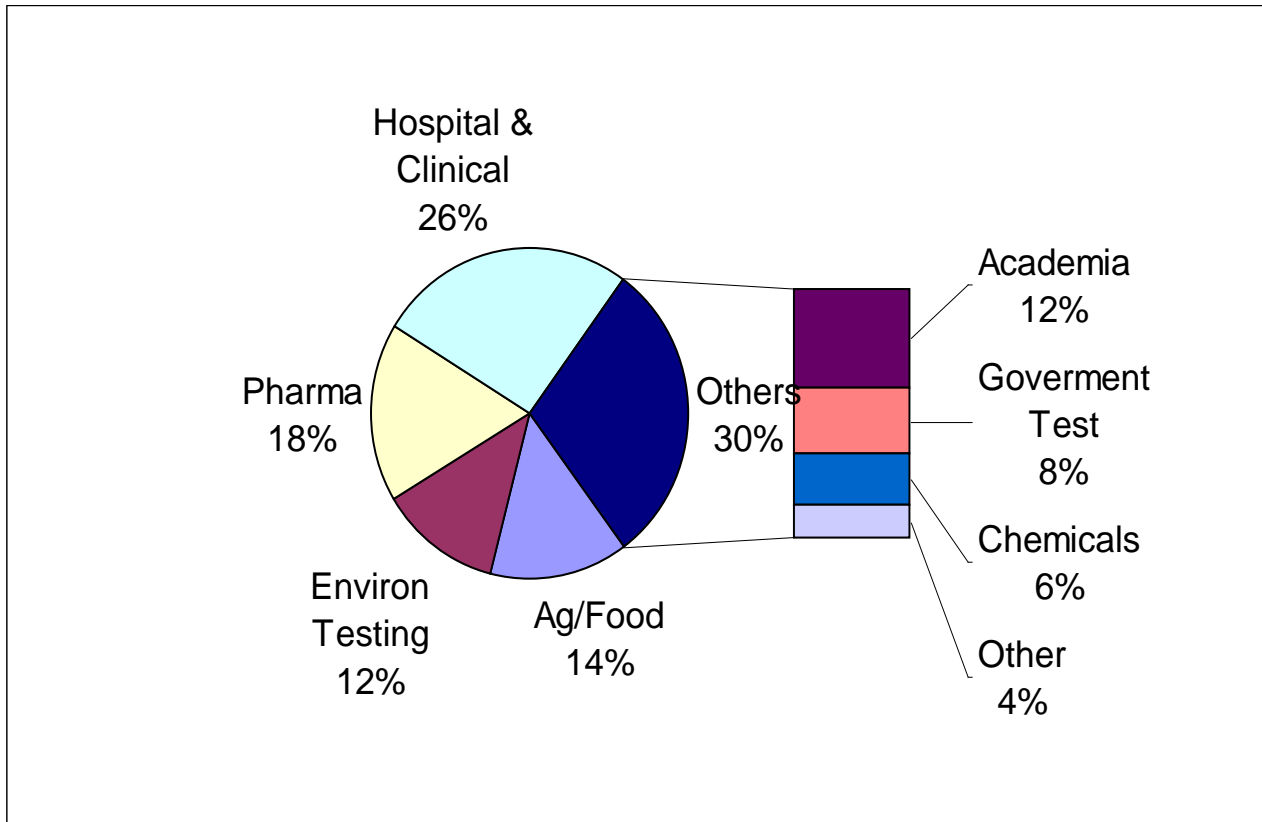


US - Merck US - Others EU - Merck EU - Others AAA - Merck AAA - Others Rest - Merck Rest - Others

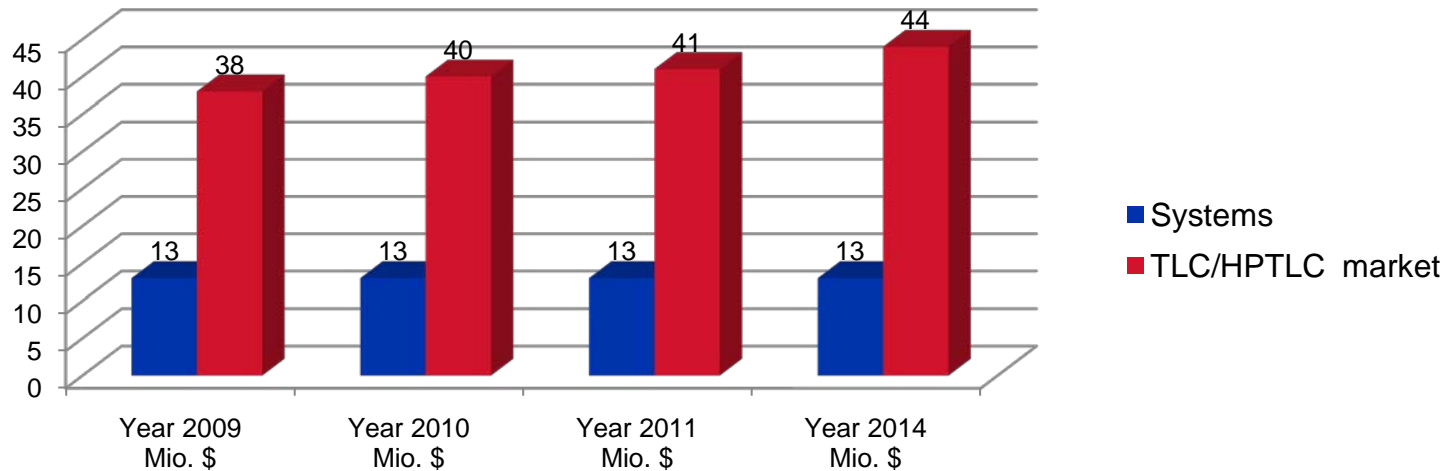
We are by far the market leader in Thin layer chromatography!

# Market Thin Layer Chromatography

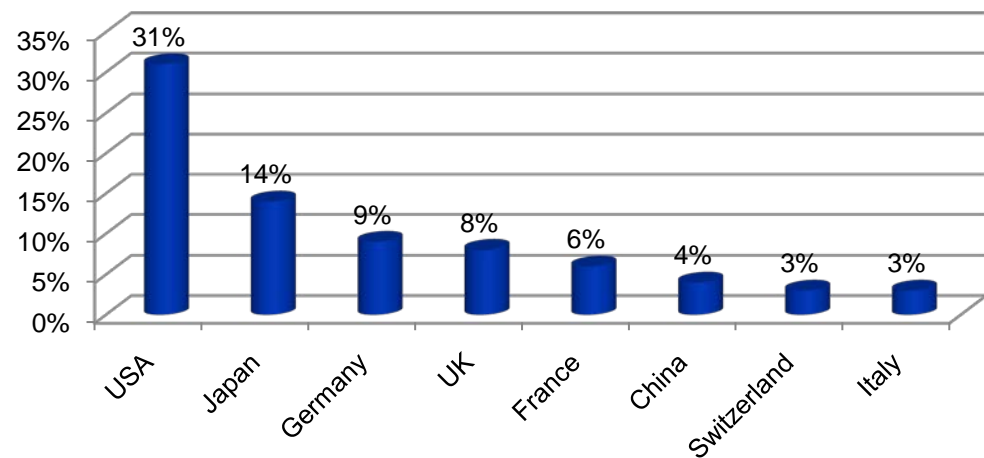
Total 40 – 50 Mio EUR  
AGR: 2 - 4%



## TLC demand by product type from 2009 until 2014

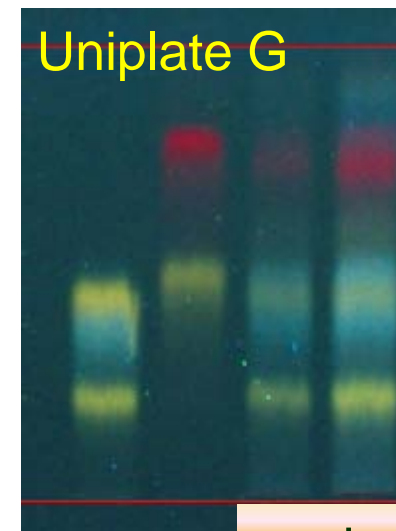
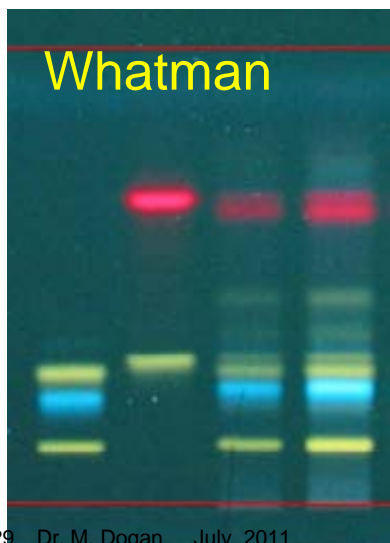
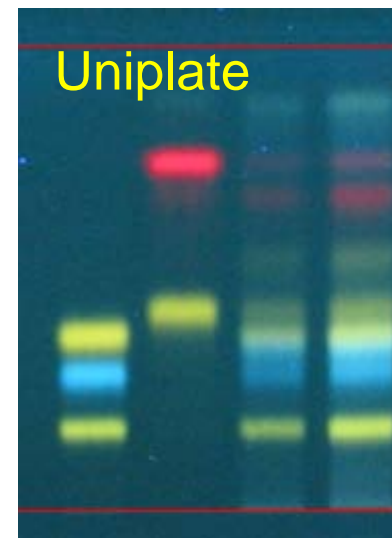
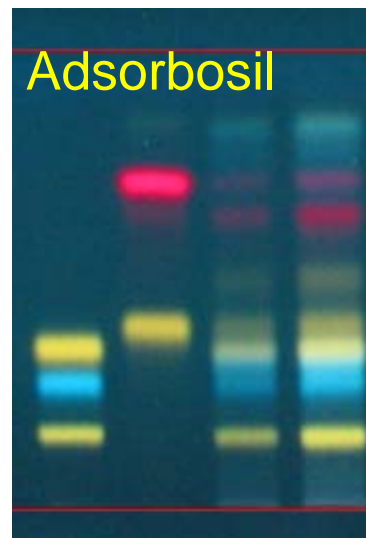
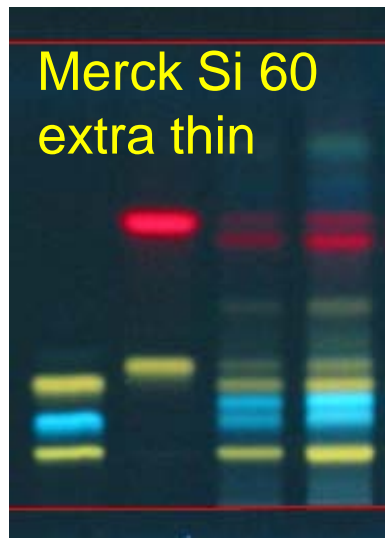
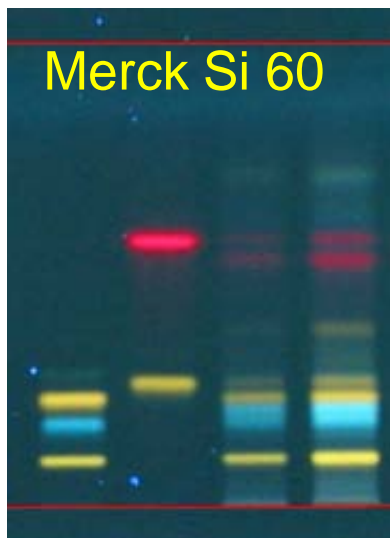


## 2009 TLC demand by country



# Comparison of Silica gel plates

## Hypericum extract





# Summary

Single use of stationary phase (TLC and HPTLC) minimizes sample preparation

Parallel separations enhances sample throughput

Ease of postchromatographic derivatization

Can perform several screenings simultaneously for different analytes

Direct use of biological detection possible

**Fast** and **low cost** screening TLC- procedure used to identify samples that should be investigated further

**We use same raw material for TLC, HPLC and Prep HPLC, which makes easy to transfer method from TLC to HPLC**

# Ideal to understand chromatography...



... train the next generation in HPTLC!