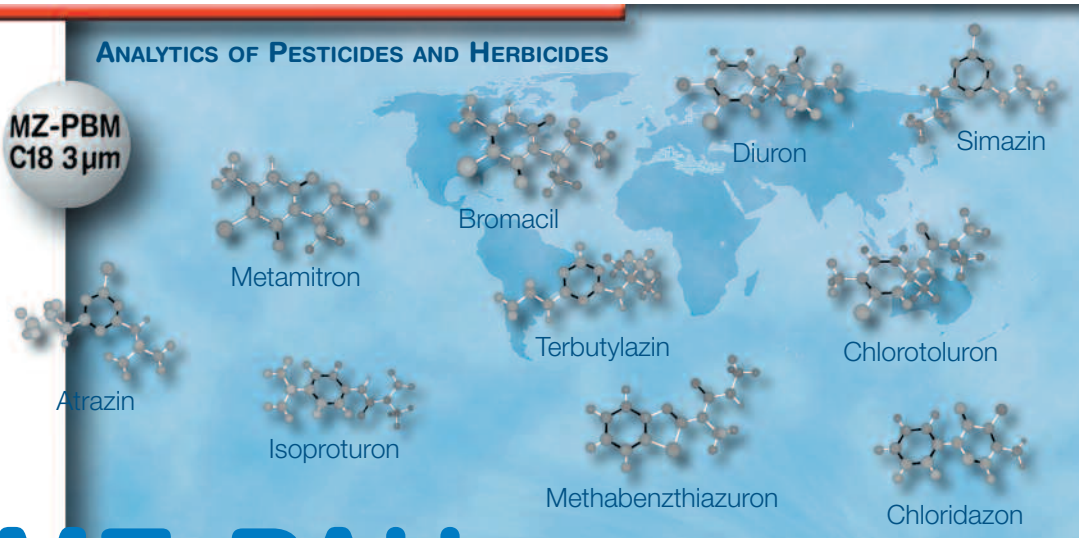
MZ ANALYSENTECHNIK

ENVIRONMENTAL ANALYSIS

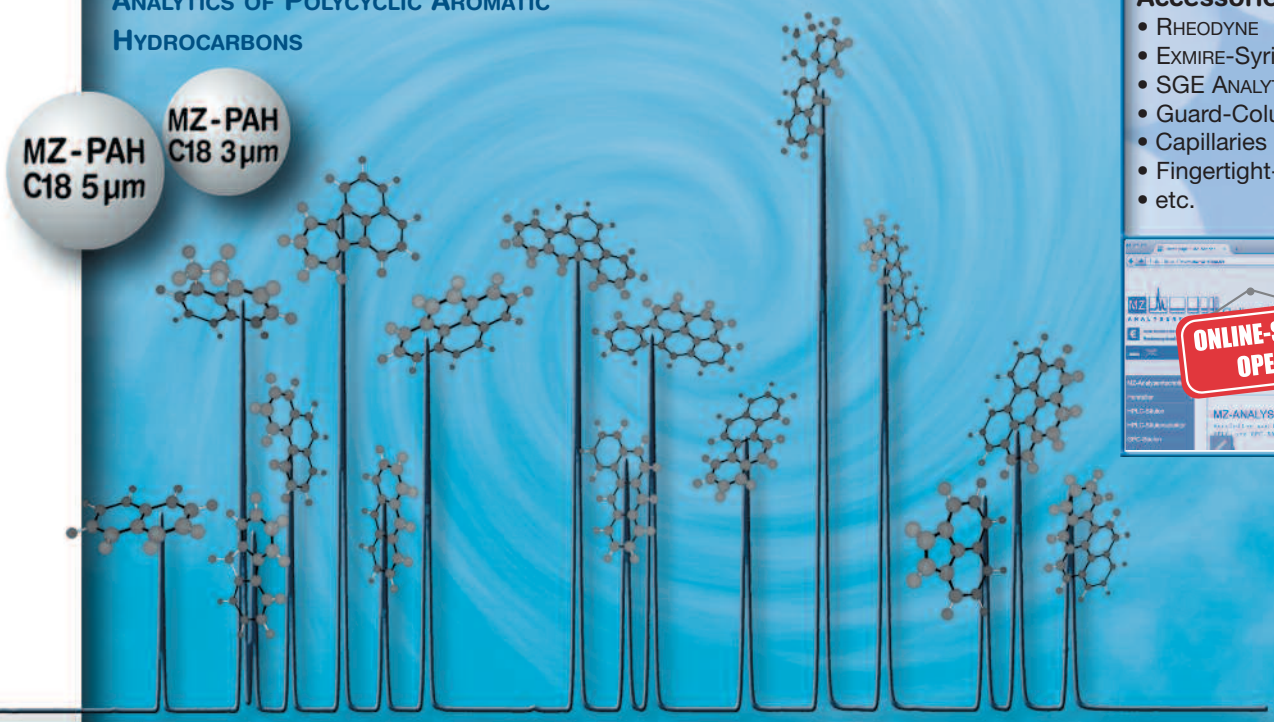
MZ-PBM 2023

ANALYTICS OF PESTICIDES AND HERBICIDES



MZ-PAH

ANALYTICS OF POLYCYCLIC AROMATIC HYDROCARBONS



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HPLC-Columns
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MZ-PAH
- Analytics of PAH´s
- 3 µm & 5 µm

MZ-PBM
- Analytics of Pesticides

MZ-Gel SD plus
- SEC-Columns hydrophobic (Styrene-Divinylbenzene)

MZ-Gel Super FG
- SEC with fluorinated Eluents

Accessories
- RHEODYNE
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info@analytic.biz

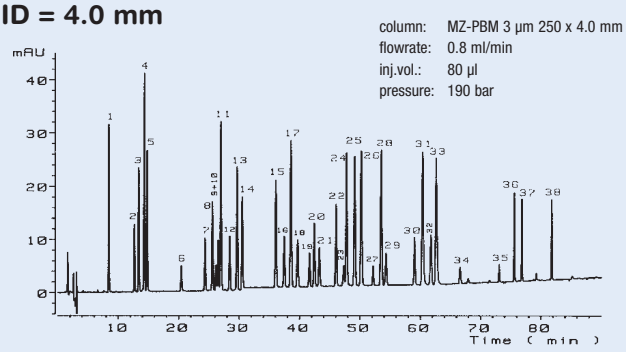
MZ-PBM: Analytics of Herbicides and Pesticides

MZ-PBM-HPLC-columns are especially developed for the separation of nitrogen-containing analytes like typical pesticides and herbicides. **MZ-PBM**-HPLC-Columns are part of DIN 38407-F12 featuring the following outstanding capabilities:

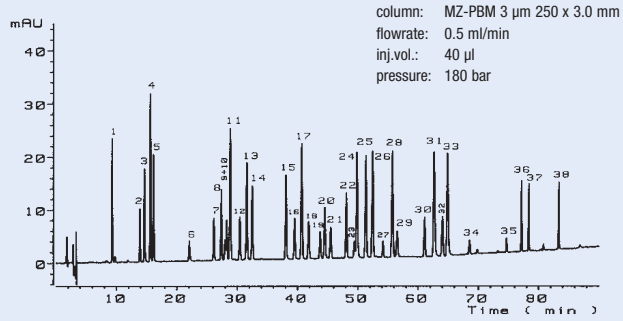
- Outstanding selectivity for nitrogen-containing pesticides and herbicides
- High efficiency: >110,000 m^{-1}
- Long durability
- Excellent value
- High reproducibility from batch to batch due to a unique coating procedure
- Refillable stainless steel column
- From narrowbore to analytical

Standard with 38 pesticides

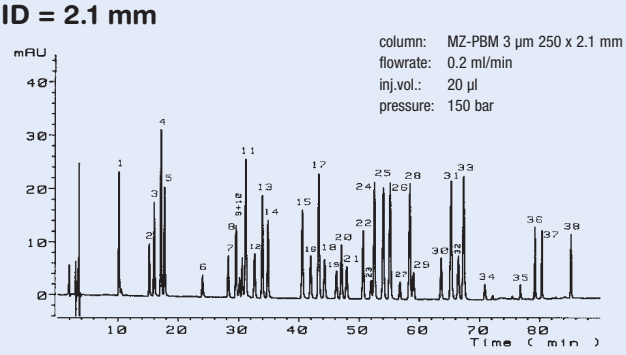
ID = 4.0 mm



ID = 3.0 mm



ID = 2.1 mm



chromatographic conditions:
sample: standard with 38 pesticides and herbicides in ACN/water 20/80 β_i = 0.5 ng/µl
gradient: start: 1 mmol ammonium acetate-water/ACN 87.5/12.5 in 60 min
linear to 45 % ACN, from 60-90 min linear up to 90 % ACN
temp.: 40 °C
detection: UV@230 nm
Analyten: 1 desisopropylatrazine 2 metamitron 3 fenuron 4 desethylatrazine 5 chloridazon 6 crimidin 7 metoxuron 8 carbetamide 9 bromoacil 10 hexazinon 11 simazin 12 metribuzin 13 cyanoazine 14 sesethylterbuthylazine 15 methabenzthiazuron 16 chlorotoluron 17 atrazine 18 monolinuron 19 diurone 20 isoproturon 21 metobromuron 22 norflurazon 23 metazachlor 24 methoprotryn 25 sebuthylazine 26 propazin 27 dimefuron 28 terbutylazin 29 linuron 30 chloroxuron 31 prometryne 32 chloropropham 33 terbutryne 34 metolachlor 35 parathionethyl 36 pencycuron 37 bifenox 38 pendimethalin

The requirements for analytical laboratories, which are implied in actual legal regulations, are very demanding for all compounds of the employed equipment. Especially analytics of pesticides and herbicides in water has become the most often used application in modern environmental analysis by HPLC.

Typically, the analytical task is based on a procedure described in DIN 38704-F12, which allows the determination of 17 active components in water. These compounds belong mainly to the group of triazines or phenylureas. Today, the task is much more demanding for the chromatographer because of the knowledge of even more active compounds.

MZ-Analysentechnik has developed a specialized HPLC-column for the analytics of pesticides and herbicides, which fully meets the requirements of today's environmental analytics. Packed with a state-of-the-art 3 µm packing material, the excellent efficiency and selectivity of the HPLC-column **MZ-PBM** enables the separation of more than 38 pesticides, herbicides and their metabolites. The unique modification procedure for the C18 surface chemistry is part of a fully ISO 9001-certified manufacturing process – giving remarkably batch-to-batch reproducibility.

Narrowbore HPLC-columns are gaining more and more importance with the introduction of ISO 14000 in many laboratories. Use of these columns enable to drastically reduce the consumption of solvent by 40 % for 3 mm ID columns and by 75 % for 2.1 mm ID columns in comparison with standard-4 mm ID columns. Our special packing procedure allows the manufacturing of small ID **MZ-PBM** columns without loss of chromatographic performance.

For the separation of pesticides and herbicides with **MZ-PBM** columns it is highly recommended to use a gradient, consisting of acetonitrile-water/ammonium acetate. Especially the often-problematic separation of methoprotryne, prometryne and terbutryne is greatly improved by the addition of ammonium acetate while at the same time reproducibility and peak symmetry are enhanced.

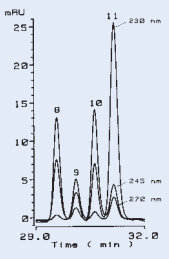
We especially would like to draw your attention onto the resolution of the herbicides diuron/isoproturon and terbutylazin/limuron, which is difficult to achieve with usual C18-columns.

Even the often-challenging separation of carbetamide/bromacil/hexazinone is enabled using **MZ-PBM** columns. The quantitation of the nearly baseline separated compounds benefits much by the usage of different detection wavelengths.

The successful reproduction of the application examples on these pages may require minor adjustments on the gradient, depending of the dead volume of the employed HPLC equipment.

Carbetamid/ Bromacil/ Hexazinon

column: MZ-PBM 250 x 4.0 mm



MZ-PAH: Separation of PolyAromatic Hydrocarbons

Polyaromatic hydrogen carbons (PAH´s) are of high relevance in environmental analysis due to their high toxicity and wide spread presence in samples from all kinds of environmental origin. Determination of these compounds in various media is usually performed by HPLC methods with fluorescence detection.

MZ-Analysentechnik has developed especially for the separation of PAH´s an optimized stationary phase named **MZ-PAH**. The base material consists of an extremely pure, wide porous, spherical, high-performance silica with extraordinary mechanical stability. A newly developed procedure allows to reproducibly modify the surface with a specially tuned C18-chemistry for maximum selectivity. The whole manufacturing process including the packing procedure of the column is ISO 9001-certified enabling us to deliver our **MZ-PAH** columns with excellent reproducibility from batch to batch and from column to column.

MZ-PAH columns exhibit the following qualities:

- Guaranteed separation of 6 PAH (DIN 38407-F8) and 16 PAH (EPA-method 610)
- Outstanding selectivity
- High efficiency: >75,000 m^{-1}
- Long durability
- High reproducibility from batch to batch
- Narrowbore to analytical
- 3 µm & 5 µm particle size
- Refillable stainless steel column

Separation of 16 PAH According to EPA

Today's "real-life" analytics of pollutants in surface water, waste water or soil samples is much more challenging than the analysis of 6 PAH according to German Drinking Water Ordinance. A more lifelike procedure is given by the US Environmental Protection Agency (EPA) Method 610, which demands the analytics of 16 PAHs. **MZ-PAH** columns permit full baseline separation of these compounds via a highly recommended gradient elution employing a linear gradient of water/acetonitrile in the temperature range of 30-35 °C. Switching of the detection wavelength allows enhancing the sensitivity of the well-separated compounds.

A remarkably good chromatographic resolution can be achieved in combination with extraordinary peak symmetry and -shape. The excellent resolution of **MZ-PAH** columns is simplifying the task of applying fluorescence wavelength programmes in routine analysis. Between benzo(ghi)perylene and indeno(1,2,3-cd)pyrene, chromatographic resolution is guaranteed to be higher than R = 3.5.

16 PAH / EPA-method 610

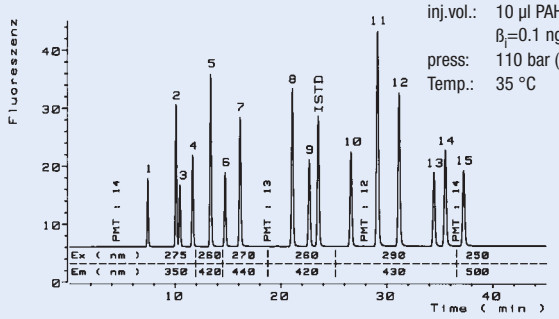
column: MZ-PAH 5 µm 250 x 3.0 mm

analytes: 1 naphthaline 2 acenaphthene 3 fluorene 4 phenanthrene 5 anthracene 6 fluoranthene 7 pyrene 8 benzo(a)anthracene 9 chrysene 10 benzo(b)fluoranthene 11 benzo(k)fluoranthene 12 benzo(a)pyrene 13 dibenz(ah)anthracene 14 benzo(ghi)perylene 15 indeno(1,2,3-cd)pyrene ISTD methylchrysene (internal standard)

gradient:

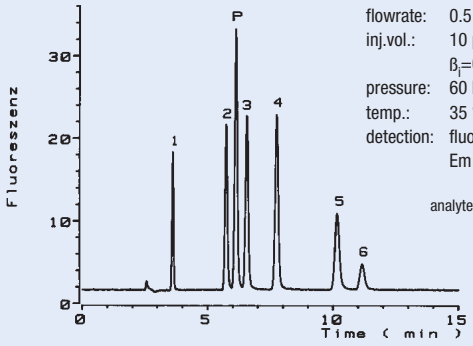
time	water	ACN
0 min	60 %	40 %
35 min	0 %	100 %
45 min	0 %	100 %

equil.: 15 min 60 % 40 %
flow: 0.5 ml/min
inj.vol.: 10 µl PAH-standard β_i=0.1 ng/µl
press: 110 bar (start)
Temp.: 35 °C



6 PAH / DIN 38407-F8

column: MZ-PAH 5 µm 250 x 3.0 mm
eluent ACN/methanol 95/5
flowrate: 0.5 ml/min
inj.vol.: 10 µl PAH-standard β_i=0.1 ng/µl
pressure: 60 bar
temp.: 35 °C
detection: fluoreszence Ex 365 / Em 470 nm



analytes: 1 fluoranthene 2 benzo(b)fluoranthene 3 benzo(k)fluoranthene 4 benzo(a)pyrene 5 benzo(ghi)-perylene 6 indeno(1,2,3-cd)pyrene P perylene

Separation of 6 PAH According to DIN 38407-F8

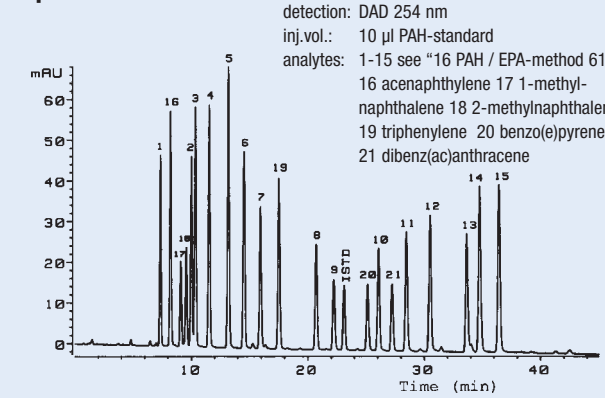
German Drinking Water Ordinance dictates the analysis of 6 PAH, which can easily be achieved with **MZ-PAH** columns by isocratic elution with acetonitrile/methanol 95/5 as mobile phase. According to the demands in DIN 38407-F8, benzo-(b)fluoranthene and perylene are well separated. Optimization of the chromatographic resolution is possible via variation of the column temperature.

Separation of 22 PAH

By using fluorescence detection, it is impossible to detect acenaphthylene, which is on the list of 16 PAH according to EPA-method 610. Therefore an auxiliary UV-detection is required, which allows in combination with **MZ-PAH** columns the separation of additional PAH, which may be useful to perform special separation tasks.

Separation of 22 PAH

conditions: see "16 PAH / EPA-method 610"
detection: DAD 254 nm
inj.vol.: 10 µl PAH-standard
analytes: 1-15 see "16 PAH / EPA-method 610" 16 acenaphthylene 17 1-methylnaphthalene 18 2-methylnaphthalene 19 triphenylene 20 benzo(e)pyrene 21 dibenz(ac)anthracene



MZ-PAH 3 µm: Separation of 18 PAH in 21 Minutes...

MZ-PAH 3 µm volumns feature shortened analysis times without loss of sensitivity and selectivity, as the most important advantage compared to reference columns packed with **MZ-PAH 5 µm** material. The columns may be used even in standard HPLC equipment, as the column length is limited to 150 mm. This keeps the backpressure in the range of compatible operation limits, although the chromatographic performance is increased compared to reference columns packed with material of 5 µm particle size.

Base silica used for 3 µm particles exhibits the same chemical and mechanical stability as the well established 5 µm material. An optimized packing procedure in combination with a special modification procedure generates **MZ-PAH 3 µm** columns for environmental analysis with high durability and excellent reproducibility.

We guarantee for all our columns **MZ-PAH 3 µm** the ability for the separation of 16 PAK according to EPA method 610 and of 6 PAK according to DIN38407-F8 – and furthermore full refill-capabilities upon the column hardware.

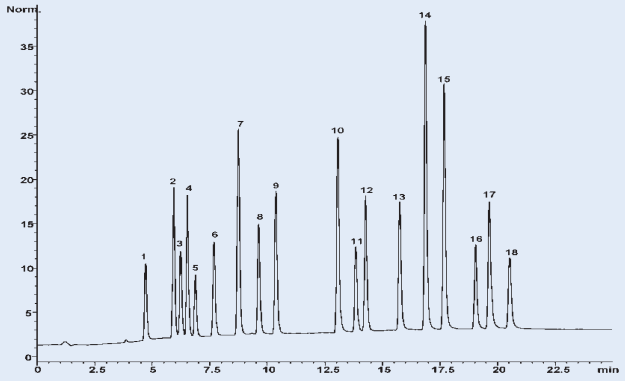
Please note: the successful reproduction of the example on the right may require minor adjustments on the gradient, depending upon the dead-volume of the utilized HPLC equipment.

18 PAH according to EPA-Method 610

column: MZ-PAH 3 µm 150 x 3.0 mm
flow: 0.5 ml/min
inj.vol.: 5 µl of 18 PAH according to EPA method 610
pressure: 192 bar (start)
temp.: 30 °C
detection: fluorescence-wavelength programme

gradient:

time [min]	H_2O [%]	MeOH [%]	ACN [%]
0	40	12	48
17	0	20	80
20	0	20	80
25	0	0	100
equil.: 15	40	12	48



analytes: 1 naphthaline 2 1-methylnaphthaline 3 2-methylnaphthaline 4 acenaphthene 5 fluorene 6 phenanthrene 7 anthracene 8 fluoranthene 9 pyrene 10 benzo(a)anthracene 11 chrysene 12 6-methylchrysene 13 benzo(b)fluoranthene 14 benzo(k)fluoranthene 15 benzo(a)pyrene 16 dibenz(ah)anthracene 17 benzo(ghi)perylene 18 indeno(1,2,3-cd)pyrene

Ordering Information

MZ-PAH 3 µm

Length x ID	Part No.
150 x 3.0 mm	MZ1100-150030
150 x 3.0 mm	MZ1100-150030R*
Guard Cartridges	
10 x 3.0 mm 5pcs.	MZ1100-VK1030
20 x 3.0 mm 5pcs.	MZ1100-VK2030

MZ-PAH 5 µm

Length x ID	Part No.
250 x 2.1 mm	MZ1111-250021
250 x 2.1 mm	MZ1111-250021R*
250 x 3.0 mm	MZ1111-250030
250 x 3.0 mm	MZ1111-250030R*
250 x 4.0 mm	MZ1111-250040
250 x 4.0 mm	MZ1111-250040R*
Guard Cartridges	
10 x 2.1 mm 5pcs.	MZ1111-VK1021
20 x 2.1 mm 5pcs.	MZ1111-VK2021
10 x 3.0 mm 5pcs.	MZ1111-VK1030
20 x 3.0 mm 5pcs.	MZ1111-VK2030
10 x 4.0 mm 5pcs.	MZ1111-VK1040
20 x 4.0 mm 5pcs.	MZ1111-VK2040

MZ-PBM 3 µm

Length x ID	Part No.
250 x 2.1 mm	MZ1122-250021
250 x 2.1 mm	MZ1122-250021R*
250 x 3.0 mm	MZ1122-250030
250 x 3.0 mm	MZ1122-250030R*
250 x 4.0 mm	MZ1122-250040
250 x 4.0 mm	MZ1122-250040R*
Guard Cartridges	
10 x 2.1 mm 5pcs.	MZ1122-VK1021
20 x 2.1 mm 5pcs.	MZ1122-VK2021
10 x 3.0 mm 5pcs.	MZ1122-VK1030
20 x 3.0 mm 5pcs.	MZ1122-VK2030
10 x 4.0 mm 5pcs.	MZ1122-VK1040
20 x 4.0 mm 5pcs.	MZ1122-VK2040

Guard Cartridge Holder

suitable for columns ID 2.1 • 3 • 4.0 • 4.6 mm		Part No.
cartridge holder **integrated** (suitable for guard cartridges of 20 & 10 mm length)		VI 74000
cartridge holder **free-standing with standard fitting** (for guard cartridges of 20 mm length)		FG 71020
cartridge holder **free-standing with standard fitting** (for guard cartridges of 10 mm length)		FG 71010

* R = Refill-Service; production of the HPLC column is based on a pre-used stainless steel tube, which is known for being virtually free of degradation during normal use. The complete internals of the HPLC-column is removed and thoroughly cleaned and all frits and the packing media are exchanged with new materials. Prices for refill are based upon sending in a refill-able HPLC-column with the same dimension as the desired one. All HPLC-columns by MZ-Analysentechnik are refill-able.

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All prices excl. VAT. Please ask for shipping costs and details.