Chromatography

MACHEREY-NAGEL

NUCLEOSHELL® Biphenyl

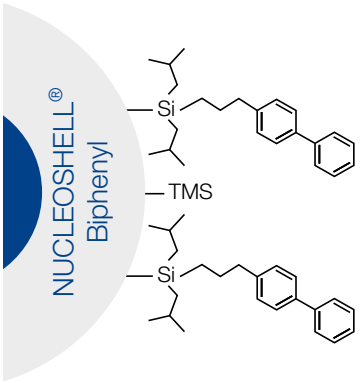
Based on core-shell technology

- Enhanced π-π interactions and remarkable efficiency
- Excellent stability in 100 % aqueous mobile phase
- Suitable for LC/MS due to low bleeding characteristics

NUCLEOSHELL® Biphenyl

Key features

- Special biphenylpropyl core-shell phase with multi-endcapping
- Separation mode based on two retention mechanisms: π-π interactions and hydrophobic interactions
- Enhanced retention for aromatic and unsaturated substances
- Excellent performance under highly aqueous conditions
- Suitable for LC/MS due to low bleeding characteristics
- Higher hydrophobcity in comparison to other aryl phases



Recommended Applications

- Overall sophisticated analytical separations
- Aromatic and unsaturated compounds
- Mycotoxins
- Phthalates
- Pesticides
- Antibiotics
- Hormones
- Pharmaceuticals
- DNPH Aldehydes

USP L11

Similar phases: Kinetex® Biphenyl, Raptor® Biphenyl, HALO® Biphenyl

Technical data

Biphenylpropyl modification with multi-endcapping on core-shell particles	
pH stability:	1.5–8.5
Particle size:	2.7 µm (core 1.7 µm)
Pore size:	90 Å
Specific surface:	130 m^2/g
Carbon content:	5.2 %

Batch-to-batch reproducibility

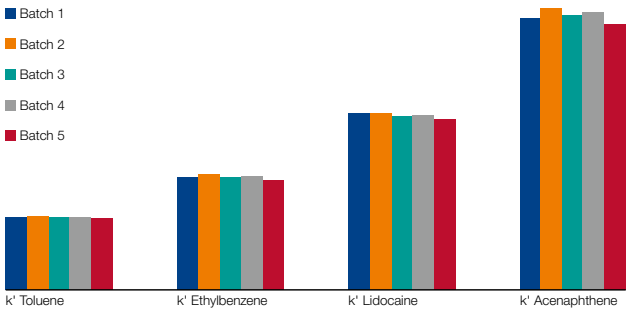
MN Appl. No. 128760

Chromatographic conditions

Column:	EC 50/4 NUCLEOSHELL® Biphenyl, 2.7 µm
MN REF:	763632.40
Eluent:	25 mM potassium dihydrogen phosphate solution – methanol (70:30, v/v), pH = 7.0
Flow rate:	1.0 mL/min
Run time:	10 min
Temperature:	30 °C
Detection:	UV, 254 nm
Injection:	1 µL

Concentration (in methanol)

Uracil	40 µg/mL (void volume marker)
Toluene	1250 µg/mL
Ethylbenzene	1250 µg/mL
Lidocaine	500 µg/mL
Acenaphthene	230 µg/mL



Excellent reproducibility

High batch-to-batch reproducibility of NUCLEOSHELL® Biphenyl columns show reliable results for different LOTs.

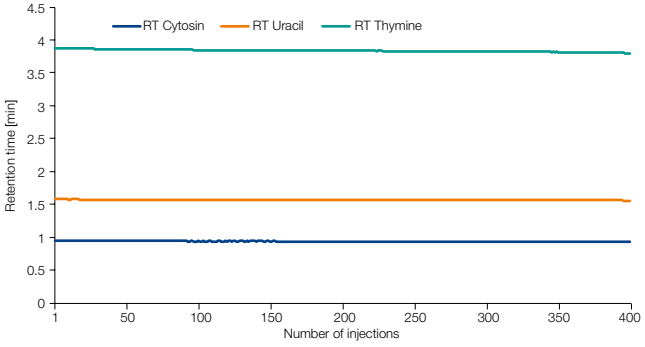
NUCLEOSHELL® Biphenyl

Stability in 100 % aqueous eluent

MN Appl. No. 128770

Chromatographic conditions

Column:	EC 100/3 NUCLEOSHELL® Biphenyl, 2.7 µm
MN REF:	763634.30
Eluent:	20 mM potassium dihydrogen phosphate solution, pH = 3.1
Gradient:	isocratic
Flow rate:	0.56 mL/min
Run time:	10 min
Temperature:	20 °C
Detection:	UV, 220 nm and 254 nm
Injection:	0.5 µL
Test mix:	Cytosine, Uracil, Thymine in water



100 % aqueous stability

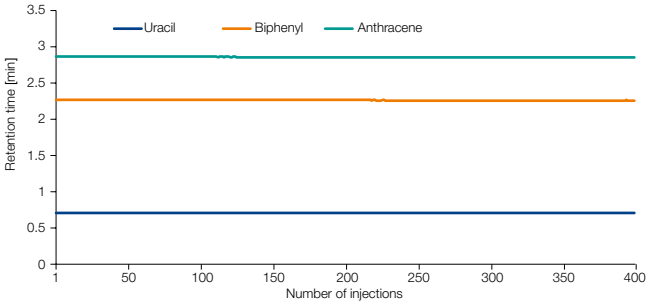
Excellent performance and ruggedness using 100 % aqueous mobile phase.

Stability in acidic medium (isocratic method)

MN Appl. No. 128790

Chromatographic conditions

Column:	EC 100/3 NUCLEOSHELL® Biphenyl, 2.7 µm
MN REF:	763634.30
Eluent:	acetonitrile – water (60:40, v/v), 1 % TFA (pH = 0.8)
Gradient:	isocratic
Flow rate:	0.56 mL/min
Run time:	10 min
Temperature:	60 °C
Detection:	UV, 254 nm
Injection:	0.2 µL
Test mix:	Uracil, Biphenyl, Anthracene in acetonitrile



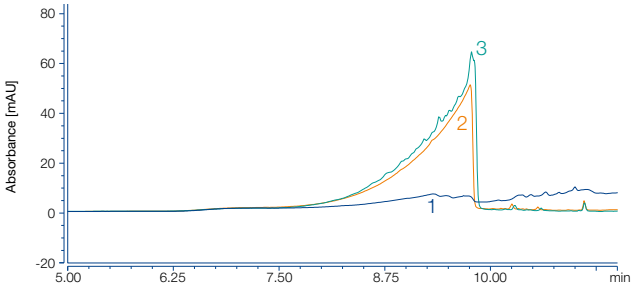
Stability in acidic medium (gradient method)

MN Appl. No. 128780

Chromatographic conditions

Column:	EC 100/3 NUCLEOSHELL® Biphenyl, 2.7 µm
MN REF:	763634.30
Eluent:	A) 1 % H_3PO_4 (pH = 1.2) B) acetonitrile
Gradient:	equilibration 10 min 10 % B, hold 10 % B for 5 min, from 10 % to 90 % B in 5 min, hold 90 % B for 3 min, in 1.0 min to 10 % B
Flow rate:	0.56 mL/min
Temperature:	40 °C
Detection:	UV, 254 nm
1.	NUCLEOSHELL® Biphenyl, 2.7 µm
2.	Kinetex® Biphenyl, 2.6 µm
3.	Raptor® Biphenyl, 2.7 µm

Chromatogram



Enhanced stability at low pH values

Very low bleeding characteristic in UV-VIS measurements compared to other core-shell biphenyl phases in acidic medium.

Disperse dyes

MN Appl. No. 128800

Chromatographic conditions

Column:	EC 100/3 NUCLEOSHELL® Biphenyl, 2.7 µm
MN REF:	763634.30
Eluent:	A) 0.1 % formic acid in water B) 0.1 % formic acid in acetonitrile
Gradient:	hold 5 % B for 2.0 min, in 6.0 min to 95 % B, hold 95 % B for 2.0 min, in 0.1 min to 5 % B, hold 5 % B for 4.9 min
Flow rate:	0.56 mL/min
Temperature:	30 °C
Detection:	MS, SMRM
Injection:	2 µL

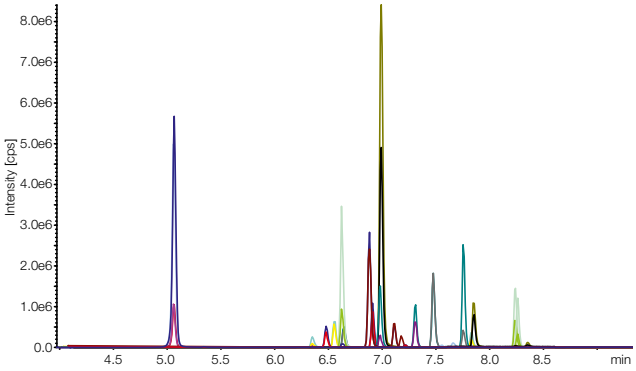
Concentration

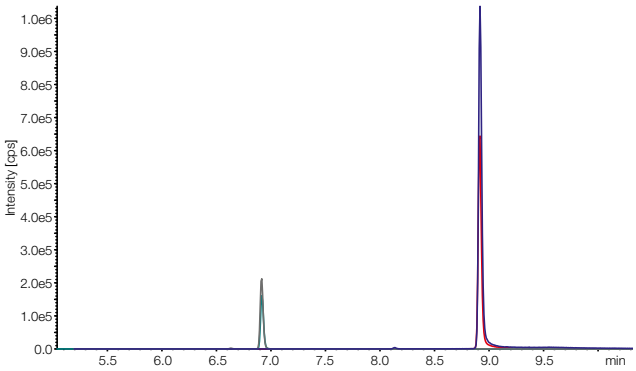
10 ng/mL for each analyte in water

MRM transitions

Analyte	Polarity	RT [min]	$[M+H]^+$	Q_1 (Quantifier)	Q_2 (Qualifier)
Basic Red 9	positive	5.0	288.2	195.0	167.0
Disperse Blue 3	positive	6.2	297.1	281.0	252.0
Disperse Red 11	positive	6.3	268.0	224.9	252.9
Basic Violet 1	positive	6.3	358.2	342.2	326.1
Disperse Yellow 9	positive	6.4	275.1	239.9	182.0
Disperse Blue 102	positive	6.4	366.1	208.0	147.1
Disperse Red 17	positive	6.5	345.1	164.0	177.0
Crystal Violet	positive	6.7	372.2	356.1	340.2
Disperse Yellow 39	positive	6.7	265.1	249.0	250.0
Disperse Yellow 3	positive	6.9	270.1	107.1	108.1
Disperse Blue 106	positive	6.9	336.1	178.1	147.0
Victoria Blue B	positive	7.1	470.3	454.3	349.1
Disperse Orange 3	positive	7.1	243.1	122.0	75.1
Disperse Brown 1	positive	7.1	433.0	197.0	357.0
Disperse Blue 35	positive	7.5	285.1	270.0	192.9
Disperse Blue 124	positive	7.6	378.1	220.0	87.1
Disperse Yellow 49	positive	7.6	375.1	238.1	223.0
Disperse Orange 11	positive	7.7	238.1	222.9	165.0
Disperse Yellow 23	positive	7.9	303.1	77.1	105.1
Disperse Blue 1	positive	8.1	269.1	237.0	161.1
Disperse Blue 26	positive	8.1	299.2	283.9	267.2
Disperse Orange 1	positive	8.2	319.1	169.0	122.0
Disperse Orange 37	positive	8.2	392.1	351.0	133.1
Analyte	**Polarity**	**RT [min]**	**$[M-H]^-$**	**Q_1 (Quantifier)**	**Q_2 (Qualifier)**
Disperse Yellow 1	negative	6.8	274.0	244.0	227.0
Disperse Orange 149	negative	8.7	457.2	265.9	121.0

Chromatograms





Mycotoxins

MN Appl. No. 128810

Chromatographic conditions

Column:	EC 100/3 NUCLEOSHELL® Biphenyl, 2.7 µm
MN REF:	763634.30
Eluent:	A) 0.1 % formic acid in water B) 0.1 % formic acid in acetonitrile
Gradient:	hold 5 % B for 1.0 min, in 3.0 min to 40 % B, in 1.0 min to 95 % B, hold 95 % B for 1.0 min, in 1.0 min to 5 % B, hold 5 % B for 3.0 min
Flow rate:	0.56 mL/min
Temperature:	40 °C
Detection:	MS, SMRM
Injection:	20 µL

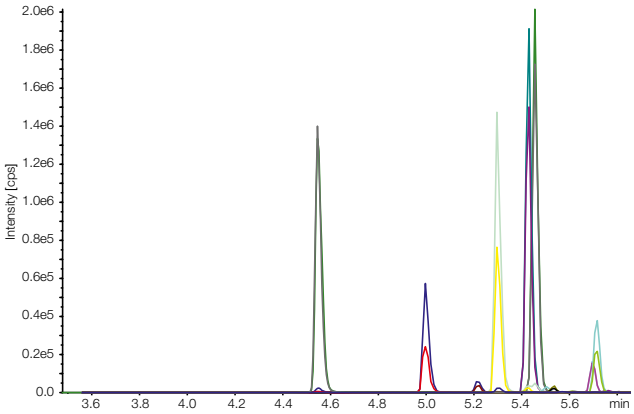
Concentration

0.5 ng/mL fumonisin B_1 in water, 5.0 ng/mL for each other analyte in water

MRM transitions

Analyte	RT [min]	$[M+H]^+$	Q_1 (Quantifier)	Q_2 (Qualifier)
Fumonisin B_1	4.55	722.2	334.2	352.3
Fumonisin B_2	5.00	706.2	336.3	318.1
HT-2 toxin	5.22	425.2	263.0	215.0
Aflatoxin G_2	5.30	331.1	313.0	244.9
Aflatoxin B_1	5.31	313.0	285.0	241.0
Aflatoxin G_1	5.43	329.0	242.9	311.0
Aflatoxin B_2	5.46	315.1	287.0	258.9
T-2 toxin	5.53	467.2	305.0	244.9
Deoxynivalenol	5.65	297.1	280.2	248.8
Zearalenone	5.70	319.1	187.1	185.0
Ochratoxin A	5.72	404.0	238.8	358.0

Chromatogram



Pesticides

MN Appl. No. 128820

Chromatographic conditions

Column:	EC 50/4.6 NUCLEOSHELL® Biphenyl, 2.7 µm
MN REF:	763632.46
Eluent:	A) 0.1 % formic acid in water B) 0.1 % formic acid in methanol
Gradient:	in 5 min from 5 % to 100 % B, hold for 1.0 min, in 0.1 min to 5 % B, hold 5 % B for 3.9 min
Flow rate:	0.70 mL/min
Temperature:	30 °C
Detection:	MS, SMRM
Injection:	20 µL

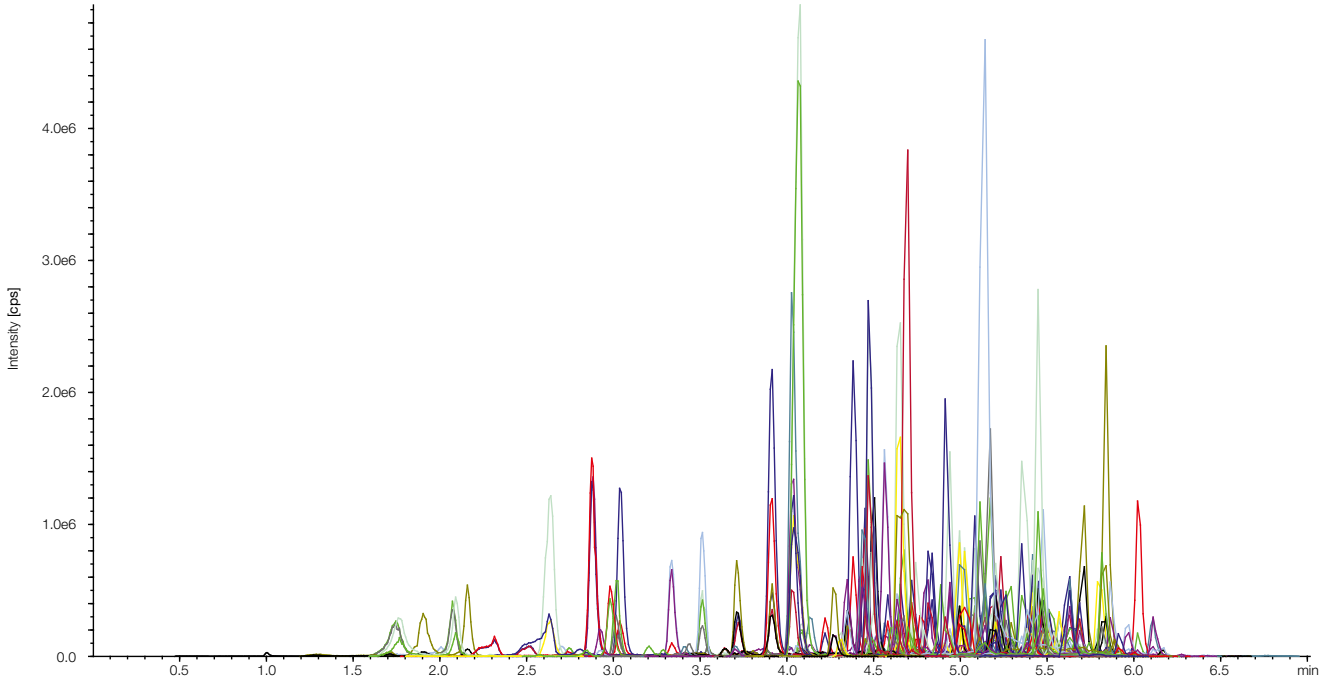
Concentration

0.4 ng/mL in water – QuEChERS mix extract (4:1, v/v)

Sample matrix:

2 g black tea (spiked with 50 µg/kg for each pesticide)

Chromatogram



Retention times / relative retention times / recovery rates

Analyte	RT [min]	Relative RT [%]†	Recovery rate [%]	Standard deviation [%]
Cyromazine	0.98	103.2	18	4.1
Methamidophos	1.70	118.9	67	10.1
Aminocarb	2.07	147.9	78	7.2
Propamocarb	2.10	161.5	26	5.8
Formetanate	2.15	158.1	68	2.5
Omethoate	2.30	119.2	81	5.1
Pymetrozine	2.31	152.0	8	17.0
Aldicarb sulfoxide	2.49	124.5	88	9.1
Carbendazim	2.62	142.4	69	6.4
Aldicarb sulfone	2.74	129.9	78	12.6
Nitenpyram	2.81	152.7	53	14.4
Mexacarbate	2.90	136.2	85	3.3
Monocrotophos	3.00	112.4	85	3.7
Flonicamid	3.01	124.9	83	4.7
Methomyl	3.01	123.4	83	4.3
Fuberidazole	3.03	132.3	72	3.2
Dicrotophos	3.31	118.2	80	2.4

Analyte	RT [min]	Relative RT [%]†	Recovery rate [%]	Standard deviation [%]
Ethirimol	3.51	135.0	41	2.8
Fenuron	3.51	115.8	85	4.9
3-Hydroxycarbofuran	3.56	114.8	87	6.2
Dimethoate	3.70	116.7	87	2.3
Imidacloprid	3.86	131.3	83	6.0
Mevinphos isomer 1	3.90	112.7	93	12.0
Mevinphos isomer 2	3.90	112.7	83	9.2
Pirimicarb	3.96	137.5	79	2.6
Cymoxanil	4.00	122.0	86	11.3
Prometon	4.06	120.5	82	2.4
Simetryn	4.07	123.7	81	2.7
Butocarboxim	4.07	120.8	91	5.7
Carbetamide	4.07	109.7	94	5.5
Aldicarb	4.08	114.9	90	6.3
Secbumeton	4.09	121.4	83	2.3
Acetamiprid	4.12	129.6	88	5.1
Imazalil	4.19	130.1	72	6.8

† in relation to NUCLEOSHELL® Bluebird RP 18

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Analyte	RT [min]	Relative RT [%]†	Recovery rate [%]	Standard deviation [%]
Thidiazuron	4.26	108.7	19	16.7
Bendiocarb	4.34	111.6	93	4.5
Propoxur	4.35	113.3	84	4.2
Ametryn	4.41	116.1	83	2.9
Fluometuron	4.42	108.9	95	5.6
Carbofuran	4.43	117.5	95	5.5
Spiroxamine isomer 1	4.45	126.4	98	5.2
Spiroxamine isomer 2	4.45	126.4	107	3.2
Carbaryl 1	4.45	109.9	92	8.4
Fenpropimorph	4.47	125.9	115	2.7
Metribuzin	4.49	116.6	89	6.2
Monolinuron	4.51	110.0	92	8.0
Thiophanate-methyl	4.53	117.1	46	19.3
Propham	4.54	107.1	75	25.2
Chlorotoluron	4.55	108.3	76	8.8
Isoprocarb	4.57	107.8	86	10.3
Oxadixyl	4.60	127.8	81	10.7
Methoprotryne	4.60	121.1	84	2.8
Metobromuron	4.63	102.9	79	12.7
Forchlorfenuron	4.64	106.7	68	4.4
Isoproturon	4.66	108.1	85	9.4
Thiofanox	4.69	115.0	63	28.5
Diuron	4.69	102.0	71	12.9
Prometryne	4.70	116.6	83	6.1
Flutriafol	4.73	112.6	82	4.1
Desmedipham	4.74	107.7	119	11.4
Pyrimethanil	4.76	113.6	82	8.3
Cycluron	4.77	109.9	89	10.5
Phenmedipham	4.78	110.4	99	6.6
Methabenzthiazuron	4.81	112.4	83	8.5
Fenobucarb	4.82	109.8	97	9.4
Linuron	4.90	107.0	87	20.4
Diethofencarb	4.91	109.8	87	12.3
Promecarb	4.92	106.5	104	22.7
Halofenozide	4.93	108.1	82	21.8
Hydramethylnon	4.94	113.8	140	10.8
Metalaxyl	4.97	115.9	89	4.8
Ethiprole	4.97	110.9	87	12.7
Paclobutrazol	4.99	108.5	88	5.0
Methiocarb	5.00	108.9	94	11.6
Flutolanil	5.01	108.0	90	6.2
Chlorantraniliprole	5.03	114.1	79	19.3
Fenamidone	5.05	110.5	82	7.1
Iprovalicarb isomer 1	5.06	106.1	96	4.4
Iprovalicarb isomer 2	5.08	106.5	96	3.6
Nuarimol	5.09	113.9	63	10.0
Ethofumesate	5.11	112.8	66	15.0
Mepronil	5.11	108.7	89	11.7
Methoxyfenozide	5.12	108.2	93	10.4
Thiacloprid	5.13	149.6	83	3.5
Furalaxyl	5.14	113.7	89	3.8
Cyproconazole isomer 1	5.14	110.5	87	4.5
Cyproconazole isomer 2	5.14	109.6	90	4.0
Cyprodinil	5.15	111.0	83	14.0
Boscalid	5.16	114.7	95	10.2
Chloroxuron	5.16	108.9	84	14.7
Triadimefon	5.18	111.4	88	12.0
Bifenazate	5.19	110.4	119	16.2
Bupirimate	5.20	117.4	86	11.3
Tetraconazole	5.20	109.7	101	13.2
Mepanipyrim	5.20	107.4	77	11.5
Neburon	5.21	105.7	93	11.5
Carfentrazone-ethyl	5.22	115.7	97	13.2
Diclobutrazol	5.25	108.9	93	11.3
Tebufenozide	5.26	109.4	92	11.7
Diflubenzuron	5.27	108.7	90	11.4
Fenarimol	5.33	112.9	89	8.7
Azoxystrobin	5.34	116.8	95	4.5
Tebuconazole	5.35	108.1	85	8.4
Hexaconazole	5.35	107.0	91	12.0
Fenoxycarb	5.36	109.2	114	13.0
Acibenzolar-S-methyl	5.38	114.7	77	14.4
Spirotetramat	5.39	113.2	55	18.7
Flusilazole	5.39	111.4	92	10.3
Picoxystrobin	5.39	108.5	110	8.7
Prothioconazole	5.40	109.5	54	23.3
Penconazole	5.40	109.3	91	6.4
Dimoxystrobin	5.41	109.5	103	8.4
Epoxiconazole	5.43	112.7	86	6.9
Diniconazole	5.43	106.7	105	15.3
Mefenacet	5.44	114.8	89	9.9
Bitertanol	5.44	109.7	91	16.9
Metconazole	5.45	109.0	76	16.7
Butafenacil	5.46	114.9	114	12.5
Etaconazole isomer 1	5.47	115.6	89	8.8
Dimethomorph isomer 2	5.48	118.4	88	6.7
Fluquinconazole	5.48	116.8	90	14.6
Fenbuconazole	5.48	113.7	94	13.1
Dimethomorph isomer 1	5.49	118.6	89	6.1
Kresoxim-methyl	5.49	109.8	78	17.2
Fluoxastrobin	5.50	114.6	117	25.8
Mandipropamid	5.53	114.0	84	11.7
Famoxadone	5.53	112.4	125	24.5
Thiobencarb	5.56	108.4	90	13.7
Ipconazole isomer 1	5.56	107.5	96.4	11.2
Ipconazole isomer 2	5.56	107.5	104	14.8
Amitraz	5.59	111.6	92	19.9
Benalaxyl	5.59	111.1	98	11.4
Pencycuron (Monceren)	5.60	109.8	90	6.7
Bromucanozole isomer 2	5.62	119.6	99	12.1
Clofentezine	5.62	108.9	92	14.4
Propiconazole isomer 1	5.64	113.0	93	8.9
Propiconazole isomer 2	5.64	113.0	86	8.2
Benzoximate	5.65	109.5	99	10.9
Pyraclostrobin	5.68	111.4	96	10.8
Prochloraz	5.69	116.8	96	8.0
Tebufenpyrad	5.69	107.6	132	7.5
Bromucanozole isomer 1	5.70	121.3	89	25.4
Buprofezin	5.70	110.3	114	4.6
Difenoconazole isomer 1	5.78	113.8	101	11.5
Piperonyl butoxide	5.81	108.0	111	3.7
Pyriproxyfen	5.82	107.4	112	3.5
Furathiocarb	5.85	110.4	113	6.4
Quinoxyfen	5.97	110.1	95	4.8
Hexythiazox	5.98	110.5	121	10.7
Rotenone	6.00	121.2	100	19.7

† in relation to NUCLEOSHELL® Bluebird RP 18

Fast analyses for sophisticated separations

LC/MS analysis of more than 150 pesticides in less than 6.5 minutes on NUCLEOSHELL® Biphenyl.

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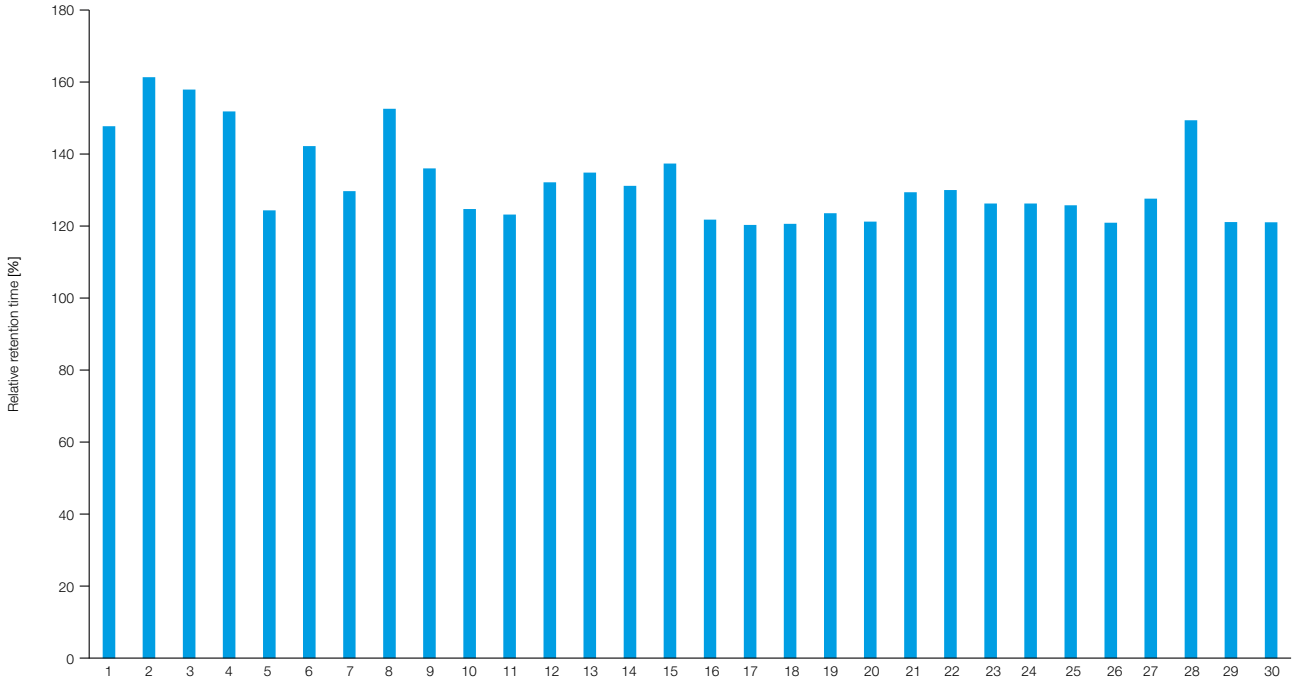
NUCLEOSHELL® Biphenyl

Continued from page 7

Relative retention times in comparison to NUCLEOSHELL® Bluebird RP 18 for selected analytes



1	Aminocarb	9	Mexacarbate	17	Cymoxanil	25	Fenpropimorph
2	Propamocarb	10	Flonicamid	18	Butocarboxim	26	Methoprotryne
3	Formetanate HCl	11	Methomyl	19	Simetryn	27	Oxadixyl
4	Pymetrozine	12	Fuberidazole	20	Secbumeton	28	Thiacloprid
5	Aldicarb sulfoxide	13	Ethirimol	21	Acetamiprid	29	Bromucanozole isomer 1
6	Carbendazim	14	Imidacloprid	22	Imazalil	30	Rotenone
7	Aldicarb sulfone	15	Primicarb	23	Spiroxamine isomer 1		
8	Nitenpyram	16	Prometon	24	Spiroxamine isomer 2		

Alternative selectivity and high hydrophobicity

Highly increased retention (alternative selectivity) for certain aryl compounds compared to a core-shell octadecylsilyl modification in methanol. The comparison with NUCLEOSHELL® Bluebird RP 18 also proves the high hydrophobicity compared to other aryl phases.

NUCLEOSHELL® Biphenyl

Phthalates

MN Appl. No. 128830

Chromatographic conditions

Column: EC 100/3 NUCLEOSHELL® Biphenyl, 2.7 µm
EC 100/3 NUCLEOSHELL® Phenyl-Hexyl, 2.7 µm
EC 100/3 NUCLEOSHELL® PFP, 2.7 µm

MN REF: 763634.30, 763734.30, 763534.30

Eluent: A) water
B) 0.1 % water in acetonitrile

Gradient: hold 50 % B for 1.5 min, in 6.0 min to 95 % B, hold 95 % B for 3.5 min, in 2.0 min to 50 % B, hold 50 % B for 4.5 min

Flow rate: 1.0 mL/min

Temperature: 30 °C

Detection: UV, 228 nm

Injection: 5 µL

Concentration

10.0 ng/mL for each analyte in water – acetonitrile (1:1, v/v)

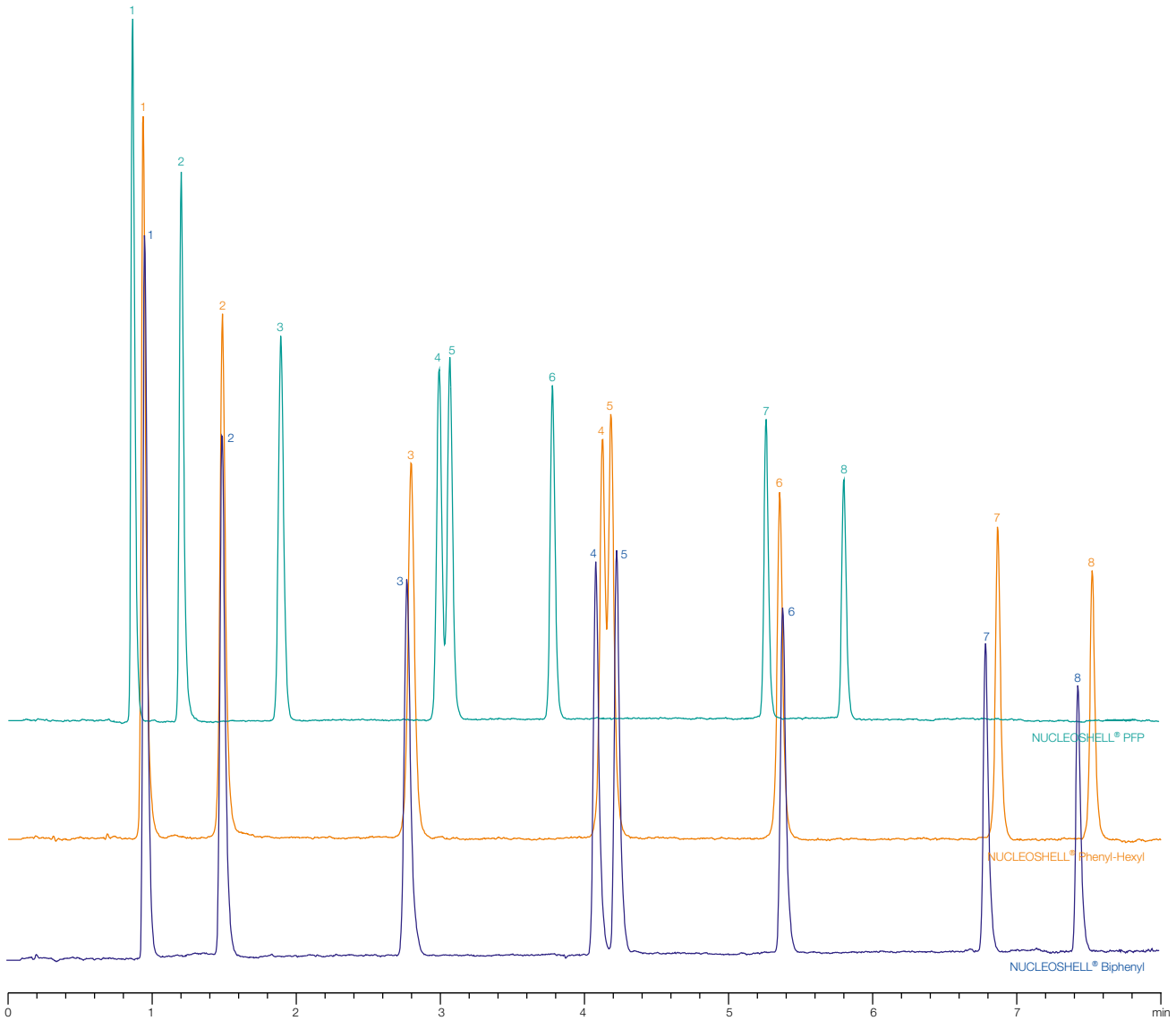
Retention times

	Analyte	Biphenyl RT [min]	Phenyl-Hexyl RT [min]	PFP RT [min]
1	Dimethyl phthalate	0.96	0.94	0.86
2	Diethyl phthalate	1.50	1.49	1.20
3	Dipropyl phthalate	2.87	2.80	1.89
4	Dibutyl phthalate	4.09	4.13	2.99
5	Benzyl butyl phthalate	4.24	4.19	3.07
6	Dicyclohexyl phthalate	5.39	5.36	3.78
7	Diheptyl phthalate	6.80	6.87	5.26
8	Dioctyl phthalate	7.44	7.53	5.80

Superior aromatic selectivity

NUCLEOSHELL® Biphenyl is able to baseline separate the critical pair dibuthyl phthalate / benzyl butyl phthalate whereas other aryl phases cannot achieve this.

Chromatograms



NUCLEOSHELL® Biphenyl

Estrogens

MN Appl. No. 128850

Chromatographic conditions

Column:	EC 50/2 NUCLEOSHELL® Biphenyl, 2.7 µm
MN REF:	REF 763632.20
Eluent:	A) 0.01 mM ammonium fluoride in water B) acetonitrile
Gradient:	from 10 % to 50 % B in 15 min, in 1.0 min to 99 % B, hold 99 % B for 1.5 min, in 0.5 min to 10 % B, hold 10 % B for 3.0 min
Flow rate:	0.30 mL/min
Temperature:	30 °C
Detection:	MS, MRM
Injection:	20 µL

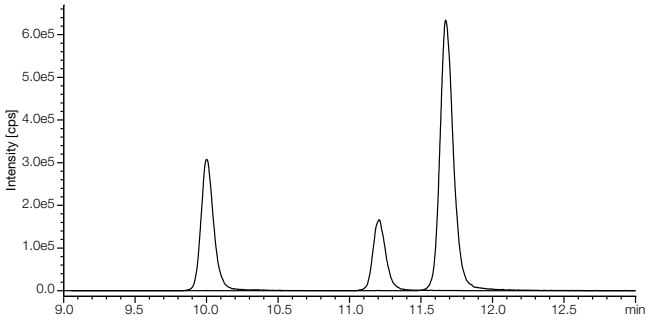
Concentration

10.0 ng/mL for each analyte in eluent A – methanol (9:1, v/v)

MRM transitions

Analyte	RT [min]	$[M-H]^-$	Q_1 (Quantifier)	Q_2 (Qualifier)
Estradiol	10.0	271.3	183.3	145.3
Estrone	11.2	295.3	145.2	143.3
Ethynylestradiol	11.7	269.3	145.2	267.2

Chromatogram



DNPH aldehydes

MN Appl. No. 128840

Chromatographic conditions

Column:	EC 50/3 NUCLEOSHELL® Biphenyl, 2.7 µm
MN REF:	REF 763632.30
Eluent:	A) water B) acetonitrile
Gradient:	in 5.0 min from 10 % to 72 % B, hold 72 % B for 1.0 min, in 1.0 min to 10 % B, hold 10 % B for 5.0 min
Flow rate:	2.0 mL/min
Temperature:	40 °C
Detection:	UV, 360 nm
Injection:	10 µL

Concentration

0.5 µg/mL for each analyte in water – acetonitrile (95:5, v/v)

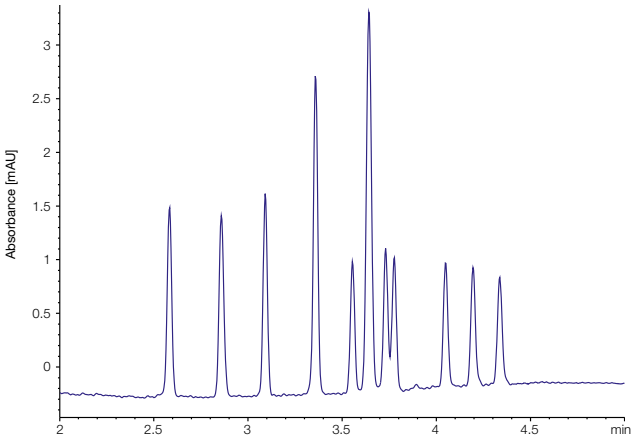
Retention times

Analyte	RT [min]
Formaldehyde	2.58
Acetaldehyde	2.86
Acetone	3.09
Isobutyraldehyde + *p*-Tolualdehyde	3.36
Hexanal	3.55
Butanal + *o*- / *m*-Tolualdehyde	3.64
Pentanal	3.73
2,5-Dimethylbenzaldehyde	3.77
Octanal	4.05
Nonanal	4.19
Decanal	4.36

For further analytes the following retention times have been determined (not presented in the chromatogram):

Analyte	RT [min]
Propanal	3.14
Acrolein	3.23
Isovaleraldehyde	3.56
Benzaldehyde	3.59
Crotonaldehyde	3.17
Cyclohexanon	3.77

Chromatogram



NUCLEOSHELL® Biphenyl

Algal toxins in mussels

MN Appl. No. 128860

Chromatographic conditions

Column:	EC 150/3 NUCLEOSHELL® Biphenyl, 2.7 µm EC 250/2 NUCLEODUR® π², 5 µm
MN REF:	763636.30, 760625.20
Eluent:	A) 50 mM formic acid B) methanol
Gradient:	hold 79 % B for 4.0 min, in 0.1 min to 83 % B, in 10.9 min to 86 % B, in 0.1 min to 98 % B, hold 98 % B for 2.9 min, in 0.1 min to 79 % B
Flow rate:	0.30 mL/min
Temperature:	40 °C
Detection:	MS, MRM
Injection:	10 µL

Concentration

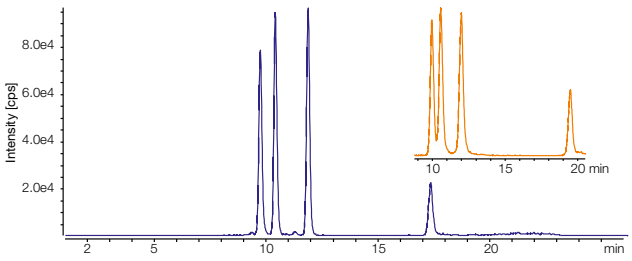
10.0 ng/mL for each analyte

We thank TeLA GmbH for the cooperation and for the method development of this application.

MRM transitions

Analyte	RT [min]	$[M+H]^+$	Q_1 (Quantifier)	Q_2 (Qualifier)
Okadaic acid	9.5	827.5	809.4	723.4
Dinophysistoxin-2	10.3	827.5	809.4	723.4
Dinophysistoxin-1	11.7	841.5	823.4	737.4
Pectenotoxin-2	17.3	881.3	837.4	539.3

Chromatograms



Advantage of core-shell vs fully porous particles

Improved peak shape and better baseline separation with NUCLEOSHELL® Biphenyl in comparison to NUCLEODUR® π².

NUCLEOSHELL® Biphenyl

Ordering information

Length	50 mm	100 mm	150 mm
NUCLEOSHELL® Biphenyl, 2.7 µm			
EC columns (pack of 1)			
2 mm ID	763632.20	763634.20	763636.20
3 mm ID	763632.30	763634.30	763636.30
4 mm ID	763632.40	763634.40	763636.40
4.6 mm ID	763632.46	763634.46	763636.46

Extend your column lifetime with our selection of guard columns

For EC column with ID of		REF guard column	Required guard column holder (Column protection system)
2 mm	EC 4/2 (pack of 3)	763638.20	718966
3 / 4 / 4.6 mm	EC 4/3 (pack of 3)	763638.30	718966

Your local distributor

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