

上海通微分析技术有限公司
Unimicro (Shanghai) Technologies Co., Ltd.

液相色谱产品应用文集



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	阿莫沙平	HALO Penta-HILIC	P30
	阿莫西林	HALO RP-Amide	P27
	阿司匹林	HALO C8	P34
		HALO ES-CN	P35
		HALO RP-Amide	P36
	氨苯蝶啶	HALO Phenyl-Hex	P33
B	氨比西林	HALO RP-Amide	P27
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	苯丙氨酸	HALO C18	P5
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	苯甲醚	HALO C18	P17
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		HALO ES-CN	P17
	苯唑西林	HALO Phenyl-Hex	P31
	丙氨酸	HALO C18	P5
	布洛芬	HALO C8	P34
		HALO ES-CN	P35
		HALO RP-Amide	P36
	布美他尼	HALO Phenyl-Hex	P33
	萘	HALO C18	P18
		HALO PFP	P18
		HALO Phenyl-Hex	P18
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	橙皮素	HALO PFP	P20
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	敌草隆	HALO C18	P25
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	丁基苯	HALO C18	P18
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序列	物质名称	色谱柱类型	页码
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	对氯苯胺	HALO C18	P15
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	非诺洛芬	HALO C8	P34
		HALO ES-CN	P35
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G	甘氨酸	HALO C18	P5
	谷氨酰胺	HALO C18	P5
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	黄芪	C18(5µm)	P9
	磺胺吡啶	GlobalSil C18-AP	P7
	磺胺酯酰	GlobalSil C18-AP	P7
	磺胺对甲氧嘧啶	GlobalSil C18-AP	P7
	磺胺二甲氧嘧啶	GlobalSil C18-AP	P6\ P7
	磺胺二甲氧嘧啶	GlobalSil C18-AP	P7
	磺胺甲恶唑	GlobalSil C18-AP	P6
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J	甲苯	HALO C18	P17
		HALO ES-CN	P17
	甲苯酰吡啶乙酸	HALO ES-CN	P35
	甲苯酰吡啶乙酸	HALO C8	P34
		HALO RP-Amide	P36
	甲砒霉素	HALO RP-Amide	P28
	甲硫氨酸	HALO C18	P5
	甲灭酸	HALO C8	P34
		HALO ES-CN	P35
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K	咖啡因	HALO Phenyl-Hex	P33
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		HALO RP-Amide	P36
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序列	物质名称	色谱柱类型	页码
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		HALO ES-CN	P35
		HALO RP-Amide	P36
	萘替芳	HALO RP-Amide	P29
		HALO C18	P22/P26
	尿嘧啶	HALO RP-Amide	P16
	柠檬黄	HALO C18	P14
P	牛磺酸 (2-氨基乙磺酸)	HALO C18	P5
	哌拉西林	HALO Phenyl-Hex	P31
Q	青霉素G	HALO Phenyl-Hex	P31
	氢氯噻嗪	HALO Phenyl-Hex	P33
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R	日落黄	HALO C18	P14
S	三甲丙咪唑	HALO Penta-HILIC	P30
	色氨酸	HALO C18	P5
	双酚氨酸	HALO RP-Amide	P36
	双氯芬酸	HALO C8	P34
		HALO ES-CN	P35
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T	天冬氨酸	HALO C18	P5
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	头孢氨苄	HALO ES-CN	P32
	头孢菌素	HALO ES-CN	P32
	头孢克洛	HALO ES-CN	P32
	头孢拉定	HALO ES-CN	P32
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	维生素A乙酸酯	HALO C18	P1
	维生素B1	HALO C18	P1
	维生素B12	Globalsil-120-5-APS	P3
		Globalsil-120-5-BP	P1
		HALO C18	P1
		HALO RP-Amide	P1
	维生素B2	Globalsil-120-5-BP	P1/P2
		HALO C18	P1
		HALO RP-Amide	P1
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	维生素B6	Globalsil-120-5-BP	P1/P4
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	维生素D3	Globalsil-120-5-SIL-P	P3
		GlobalsilS-120-5-C18-AP	P3
		HALO C18	P1
	维生素E	Globalsil-120-5-C18-AP	P4
		Globalsil-120-5-SIL-P	P5
		HALO C18	P1
维生素K3	Globalsil-120-5-BP	P4	
	HALO C18	P1	
X	苋菜红	HALO C18	P14
	香兰素	HALO C18	P26
	香叶木甙	HALO PFP	P20
		HALO Phenyl-Hex	P21
	缬氨酸	HALO C18	P5
	新红	HALO C18	P14
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	烟酸	Globalsil-120-5-APS	P6
		Globalsil-120-5-BP	P1/P6
		HALO C18	P1
		HALO RP-Amide	P1
	叶酸	Globalsil-120-5-BP	P1

序列	物质名称	色谱柱类型	页码
Y	叶酸	HALO C18	P1
		HALO RP-Amide	P1
	异丙隆	HALO C18	P25
		HALO Phenyl-Hexyl	P24
	异亮氨酸	HALO C18	P5
	益康唑	HALO RP-Amide	P29
	薏苡仁	C18(5um)	P12
	银杏	C18(5um)	P10
	吲达帕胺	HALO Phenyl-Hex	P33
	茛醇	HALO C18	P17
		HALO ES-CN	P17
	诱惑红	HALO C18	P14
Z	长杀草	HALO C18	P23
	浙贝母	C18(5μm)	P10
	知母	C8(5μm)	P11
	酯维注射液	硅胶柱(5μm)	P13
	组氨酸	HALO C18	P5
NO.	3,4-DNT	HALO C18	P17
		HALO ES-CN	P17
	2,3-DNT	HALO C18	P17
		HALO ES-CN	P17
	2,4-DNT	HALO C18	P17
		HALO ES-CN	P17
	1-苯基萘	HALO C18	P18
		HALO PFP	P18
		HALO Phenyl-Hex	P18
	1-氯-4-硝基苯	HALO C18	P17
		HALO ES-CN	P17
	2,3-二硝基甲苯	HALO RP-Amide	P16
	2,4-二硝基甲苯	HALO RP-Amide	P16
	2,6-二硝基甲苯	HALO RP-Amide	P16
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其它	批次重复性实验	HALO C18	P37
	相关性文献	HALO	P38-P40

饲料添加剂

饲料中混合维生素检测

色谱条件

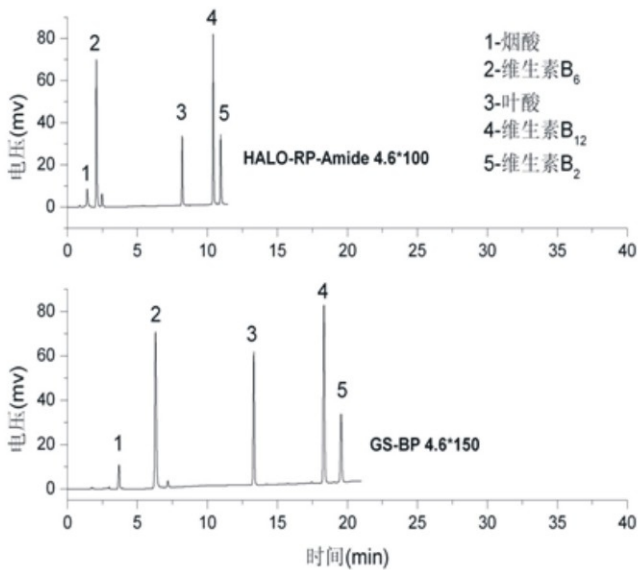
色谱柱：Globalsil-120-5-BP 4.6*150 mm
HALO RP-Amide 4.6*100 mm (2.7 μm)
流动相：

	20 mm 磷酸二氢铵	乙腈
0 min	98 %	2 %
20 min	78 %	22 %

流速：1.0 mL/min
检测波长：UV 280 nm
温度：35℃

仪器与设备

EasySep™- 1020型自动化高效液相色谱
Globalsil-120-5-BP 4.6*150 mm
HALO RP-Amide 4.6*100 mm (2.7 μm)



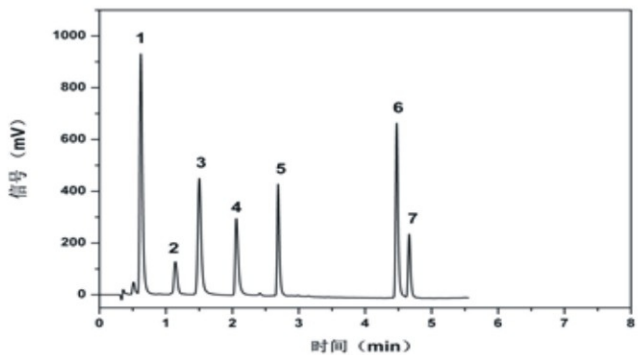
饲料中水溶性/脂溶性维生素检测

色谱条件

核壳型HALO C18 2.7 μm
专用分析方法包

仪器与设备

EasySep™- 1020型自动化高效液相色谱
核壳型HALO C18 2.7 μm



水溶性维生素谱图

(1) 烟酸、(2) 维生素B5、(3) 维生素B6、(4) 维生素B1
(5) 叶酸、(6) 维生素B12、(7) 维生素B2

色谱条件

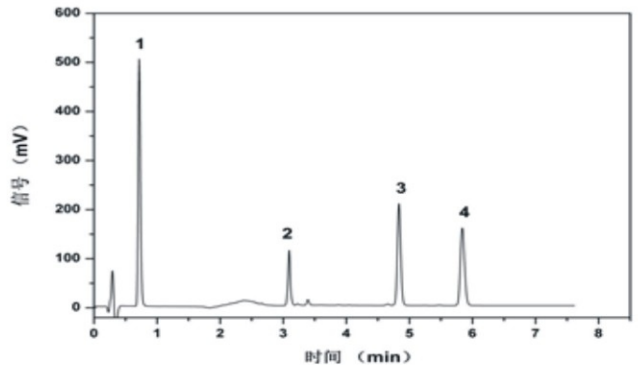
核壳型HALO C18 2.7 μm
专用分析方法包

仪器与设备

EasySep™-1020型自动化高效液相色谱
核壳型HALO C18 2.7 μm

方法特点

7分钟内完成分离检测
检测波长采用波长时间程序



脂溶性维生素谱图

(1) 维生素K, (2) 维生素A乙酸酯 (3) 维生素D, (4) 维生素E

饲料添加剂

饲料中维生素A检测

检测标准品

维生素A乙酸酯

色谱条件（反相）

色谱柱：Global-sil-120-5-C18-AP 4.6*150 mm，C18，5 μ m

流动相：甲醇：水=95:5，流动相流速1.0 mL/min

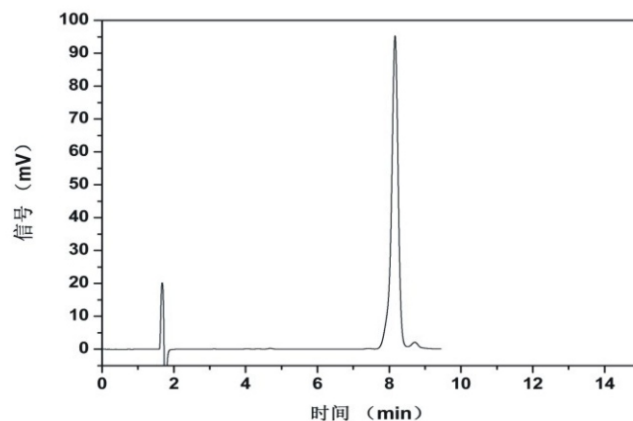
检测波长：326 nm

进样浓度：2.6 μ g/mL

检测限：2 ng/mL

仪器与设备

EasySep™- 1020型梯度液相色谱



维生素A谱图（反相）

检测标准品

维生素A乙酸酯

色谱条件（正相）

色谱柱：Global-sil-120-5-SIL-P 4.6*150 mm，SIL，5 μ m

流动相：正己烷：异丙醇=98：2

流速：1.0 mL/min

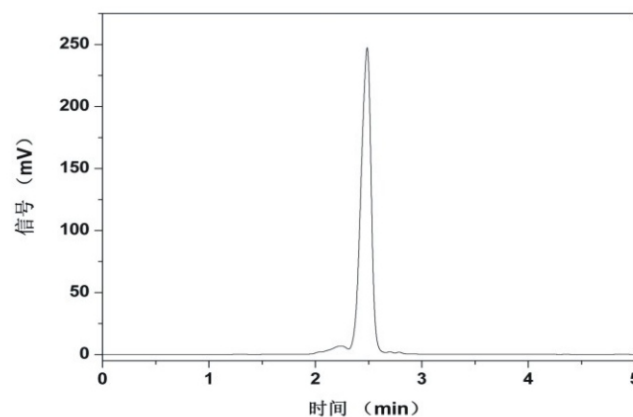
检测波长：326 nm

进样浓度：3.5 μ g/mL

检测限：3 ng/mL

仪器与设备

EasySep™- 1020型梯度液相色谱



维生素A谱图（正相）

饲料中维生素B2检测

色谱条件

参考国标：GB/T 14701-2002

色谱柱：Global-sil-120-5-BP 4.6 X150 mm

流动相：国标方法配制

流速：0.8 mL/min

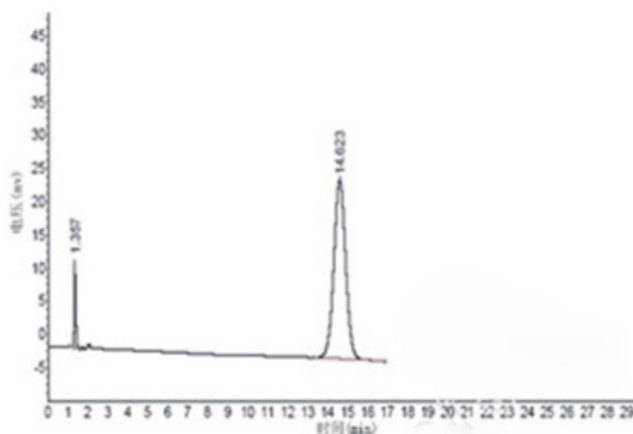
温度：26℃

波长：紫外267 nm

仪器与设备

EasySep™- 1020型自动化高效液相色谱

Global-sil-120-5-BP 4.6X150 mm



维生素B2谱图

饲料添加剂

饲料中维生素B12检测

色谱条件

参考国标：GB/T 17819-1999

色谱柱：Globalsil-120-5-APS 4.6X250 mm

流动相：3%正磷酸水溶液260 mL与700 mL乙腈混合

流速：1.7 mL/min

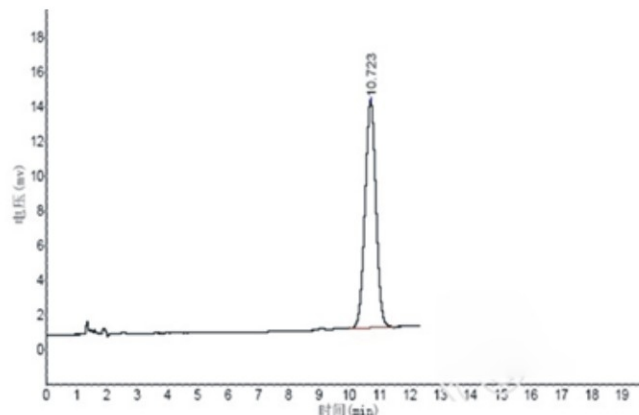
温度：30℃

波长：紫外361 nm

仪器与设备

EasySep™-1020自动化高效液相色谱系统

Globalsil-120-5-APS 4.6X250 mm



维生素B12谱图

饲料中维生素D3检测

色谱条件（反相）

色谱柱：Globalsil-120-5-C18-AP 4.6*150 mm, C18, 5 μm

流动相：甲醇：水=95:5

流速：1.0 mL/min

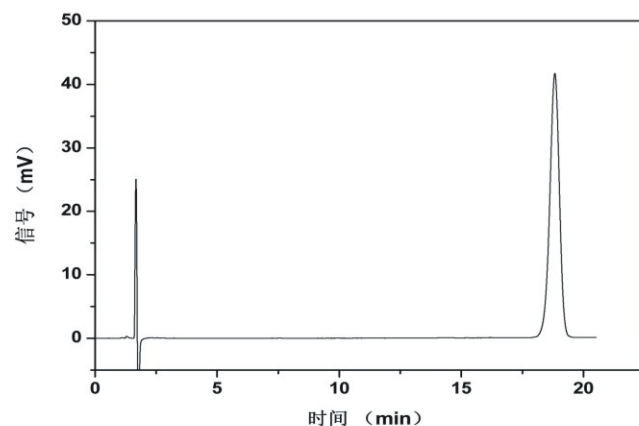
检测波长：264 nm

进样浓度：10 μg/mL

检测限：10 ng/mL

仪器与设备

EasySep™-1020型梯度液相色谱



维生素D3谱图（反相）

色谱条件（正相）

色谱柱：Globalsil-120-5-SIL-P 4.6*150 mm, SIL, 5 μm

流动相：正己烷：1,4-二氧六环=93:7

流速：1.0 mL/min

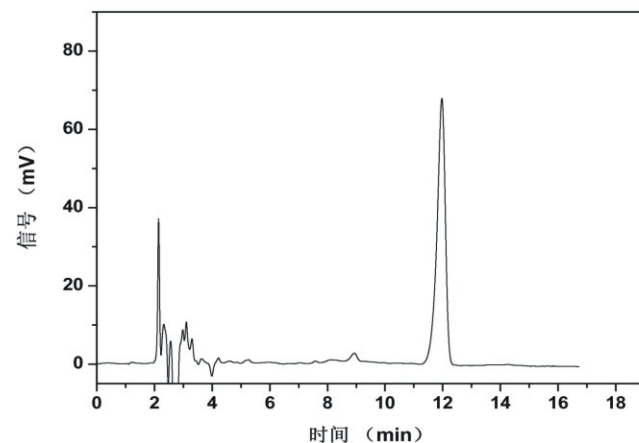
检测波长：264 nm

进样浓度：10 μg/mL

检测限：30 ng/mL

仪器与设备

EasySep™-1020型梯度液相色谱



维生素D3谱图(正相)

饲料添加剂

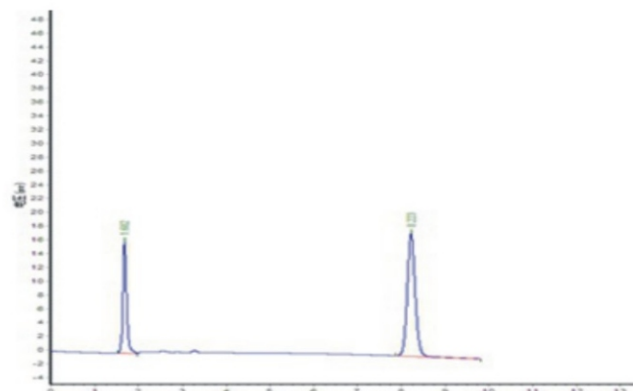
饲料中维生素B6/K3检测

色谱条件

色谱柱：GS-120-5-BP 4.6X150 mm
流动相：国标方法配制
流速：0.8 mL/min
检测波长：紫外280 nm
温度：26 °C

仪器与设备

EasySep™- 1020型梯度液相色谱



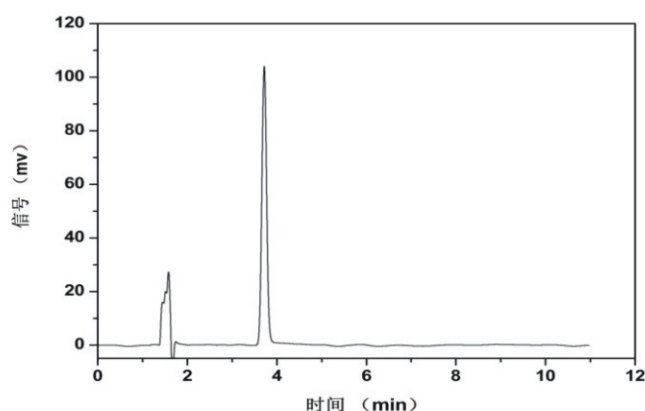
维生素B6谱图

色谱条件

色谱柱：Globasil-120-5-BP 4.6X150 mm
流动相：甲醇：水=75:25
流速：1.0 mL/min
检测波长：251 nm
进样浓度：4.9 µg/mL
检测限：20 ng/mL

仪器与设备

EasySep™- 1020型梯度液相色谱



维生素K3谱图

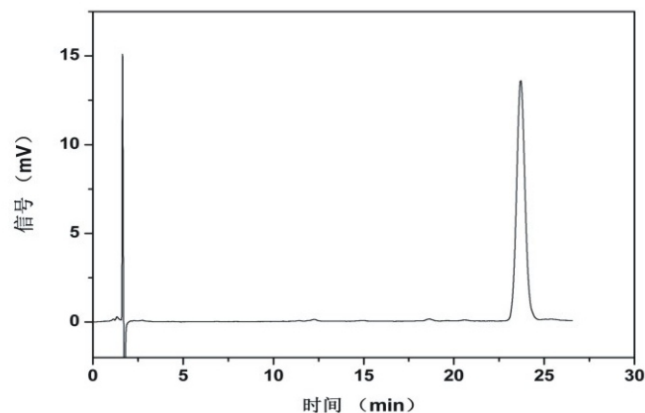
饲料中维生素E检测

色谱条件（反相）

色谱柱：GlobasilS-120-5-C18-AP 4.6*150 mm, C18, 5 µm
流动相：甲醇：水=95:5
流速：1.0 mL/min
检测波长：264 nm
进样浓度：10 µg/mL
检测限：10 ng/mL

仪器与设备

EasySep™- 1020型梯度液相色谱



维生素E谱图（反相）

饲料添加剂

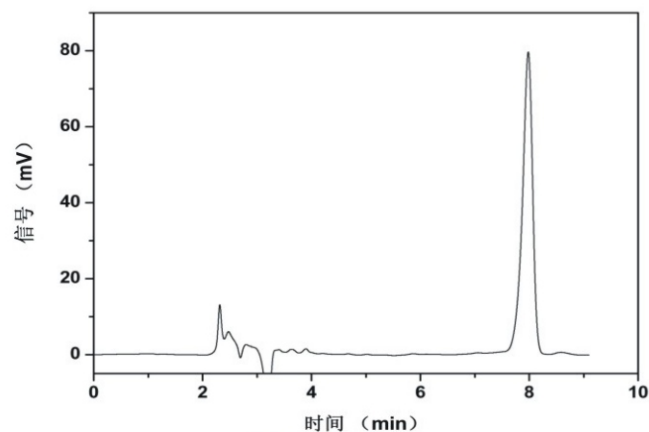
饲料中维生素E检测

色谱条件（正相）

色谱柱：GlobalSil-120-5-SIL-P 4.6*150 mm, SIL, 5 μ m
流动相：正己烷：1,4-二氧六环=97:3
流速：1.0 mL/min
检测波长：280 nm
进样浓度：50 μ g/mL
检测限：100 ng/mL

仪器与设备

EasySep™-1020型梯度液相色谱



维生素E谱图（正相）

饲料中20种氨基酸检测

上海通微根据国家标准相关内容对饲料中氨基酸的分析要求，针对目前氨基酸的分析检测均需柱前或柱后衍生的弊端，建立一种反相高效液相色谱-蒸发光散射检测（RP-HPLC-ELSD）直接测定未衍生氨基酸的分析方法，并将其用于饲料中氨基酸含量的测定。本分析方法采用HALO C18柱色谱柱，20种氨基酸在30 min内完成分离检测，样品加样回收率为88.0%~120.3%。

色谱条件

色谱柱：HALO C18柱，2.7 μ m，4.6X150 mm
专用分析方法包

规范性文件

GB/T 6682规定的一级水

仪器与设备

UM 5000 型蒸发光散射检测器
HALO C18柱，2.7 μ m，4.6X150 mm

应用范围

本方法适用于分析水解氨基酸或游离氨基酸

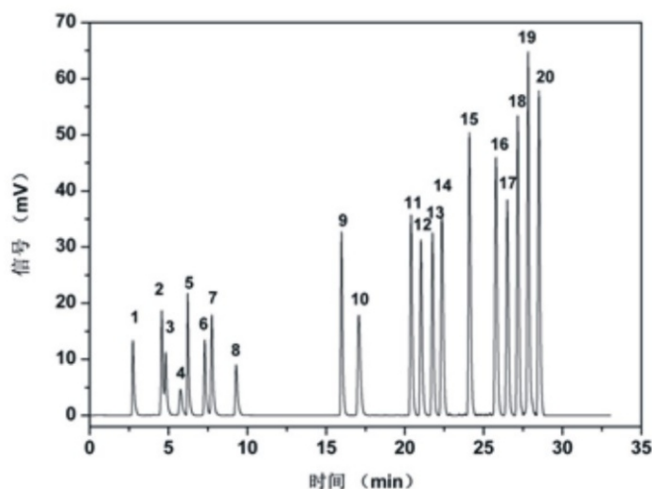
本方法适用于饲料中氨基酸含量的分离检测

本方法可测定20种氨基酸，包括：牛磺酸（2-氨基乙磺酸）、甘氨酸、丝氨酸、天冬氨酸、谷氨酰胺、苏氨酸、丙氨酸、半胱氨酸、胱氨酸、脯氨酸、赖氨酸、组氨酸、缬氨酸、精氨酸、甲硫氨酸、酪氨酸、异亮氨酸、亮氨酸、苯丙氨酸、色氨酸

备注：基本氨基酸中缺少谷氨酸

注意事项

本方法测定各氨基酸最低检测限不高于5 mg/L (S/N>3)



饲料中20种氨基酸谱图

- 1、牛磺酸（2-aminoethanesulfonic acid）；
- 2、甘氨酸（Gly）；
- 3、丝氨酸（Ser）；
- 4、天冬氨酸（Asp）；
- 5、谷氨酰胺（Gln）；
- 6、苏氨酸（Thr）；
- 7、丙氨酸（Ala）；
- 8、半胱氨酸（Cys）；
- 9、脯氨酸（Pro）；
- 10、胱氨酸（Cys）；
- 11、赖氨酸（Lys）；
- 12、组氨酸（His）；
- 13、缬氨酸（Val）；
- 14、甲硫氨酸（Met）；
- 15、精氨酸（Arg）；
- 16、酪氨酸（Tyr）；
- 17、异亮氨酸（Ile）；
- 18、亮氨酸（Leu）；
- 19、苯丙氨酸（Phe）；
- 20、色氨酸（Trp）。

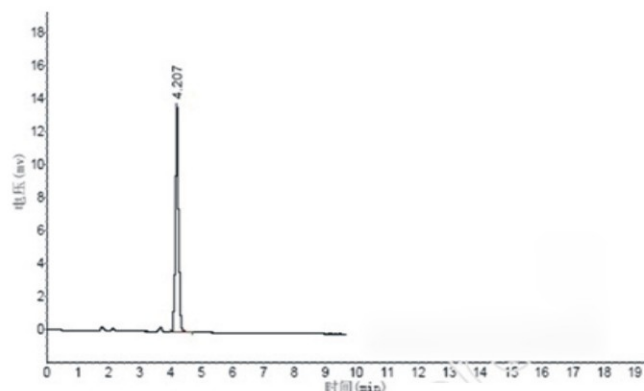
饲料添加剂

饲料中烟酸检测

色谱条件（反相）

参考国标：GB/T 17819-1999

色谱柱：Globalsil-120-5-APS 4.6X250 mm



烟酸谱图（反相）

色谱条件（正相）

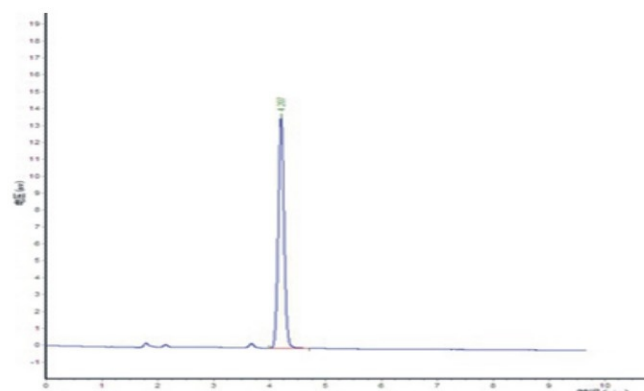
色谱柱：Globalsil-120-5-BP 4.6X250 mm

流动相：2% 乙腈磷酸缓冲溶液（国标方法配制）

流速：1.0 mL/min

温度：25°C

波长：紫外280nm



烟酸谱图（正相）

饲料中磺胺类抗生素检测—标准方法重现

根据饲料中磺胺类抗生素分析项目工作计划，对相关的国家标准和农业部标准进行重现。

色谱条件(等度)

参考国标：GB/T 19542-2007

色谱柱：Glaobalsil-C18-AP 4.6*250 mm ; 5 μm

流动相：乙腈：水：乙酸=250:750:3

流速：1.0 mL/min

检测波长：270 nm

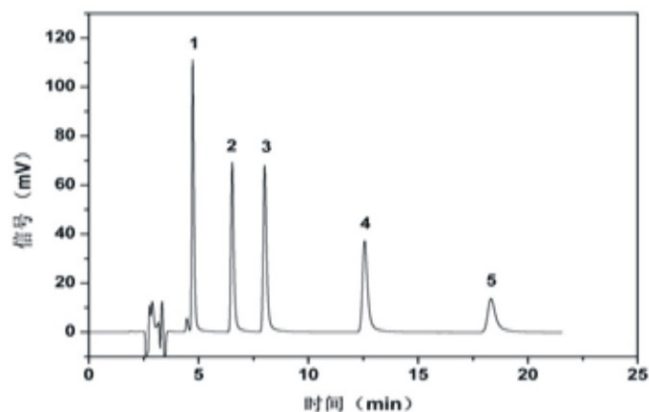
进样体积：20 μL

进样浓度：10 μg/mL

仪器与设备

EasySep™- 1020型等度液相色谱

Glaobalsil- C18-AP色谱柱



(1) 磺胺嘧啶, (2) 磺胺二甲基嘧啶, (3) 磺胺甲恶唑
(4) 磺胺间甲氧嘧啶 (5) 磺胺喹恶啉

饲料添加剂

饲料中磺胺类抗生素检测—标准方法重现

色谱条件(梯度)

参考标准：农业部1486号公告-7-2010
色谱柱：C18-AP 4.6*250 mm ; 5 μ m
流动相：A：甲醇：乙腈=1：1
B：0.1%乙酸水溶液
流速：1.0 mL/min
检测波长：270 nm
进样体积：20 μ L
进样浓度：10 μ g/mL

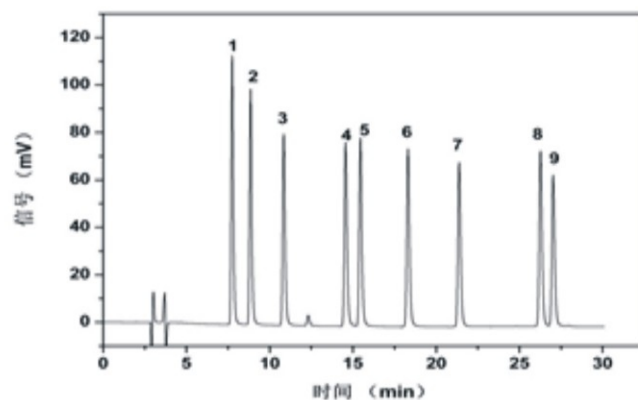
仪器与设备

EasySep™- 1020型等度液相色谱
Glaobalsil- C18-AP色谱柱

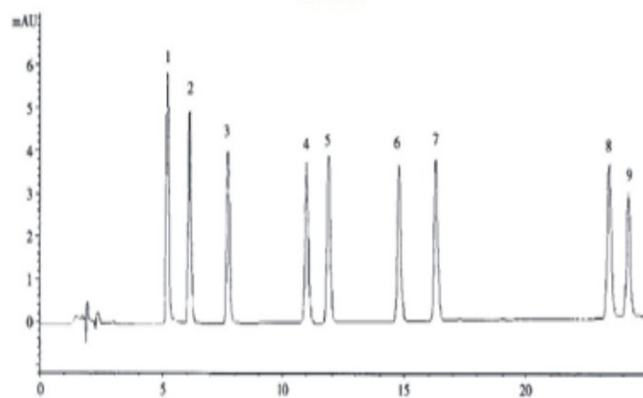
应用说明

根据目前方法重现的结果，国标方法和农业部方法都得到了很好的重现效果，在不改变分析方法和梯度条件的情况下，以我公司Glaobalsil C18 AP 4.6*250 mm ; 5 μ m色谱柱，可替代农业部标准中C18 4.6*150 mm ; 3.5 μ m色谱柱可实现样品的有效分离。

(1) 磺胺醋酰 (2) 磺胺嘧啶 (3) 磺胺吡啶 (4) 磺胺二甲基嘧啶
(5) 磺胺对甲氧嘧啶 (6) 磺胺甲基异恶唑 (7) 磺胺间甲氧嘧啶
(8) 磺胺二甲氧嘧啶 (9) 磺胺喹恶啉



(实例)



(国标)

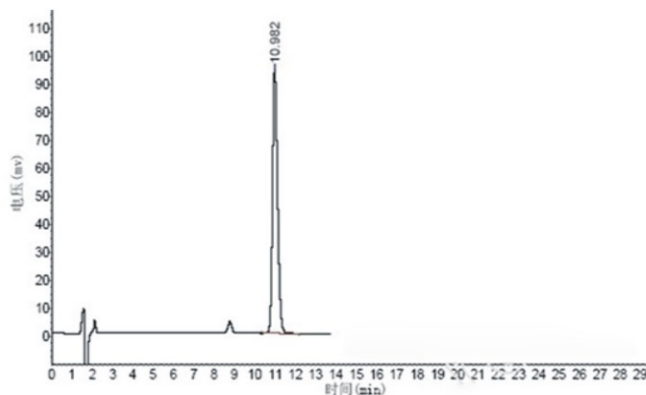
饲料中泛酸检测

色谱条件(梯度)

参考国标：GB/T 18697-2001
色谱柱：Globalsil-120-5-BP 4.6x150 mm
流动相：磷酸缓冲盐 (国标)
流速：1 mL/min
温度：室温
波长：紫外200 nm

仪器与设备

EasySep™- 1020型自动化高效液相色谱
Globalsil-120-5-BP 4.6x150 mm



泛酸谱图

饲料添加剂

饲料中苏丹红染料检测(一)

色谱条件

色谱柱：Globalsil C18，4.6*250 mm，5 μ m

检测条件同农业部苏丹红样品检测方法（NY/T 1258-2007）

流动相：A：乙腈，B水

时间 (min)	溶剂 (A%)	溶剂 (B%)
0.00	95	5
8.00	100	0
28.00	100	0
29.00	95	5
35.00	95	5

流速：1.0 mL/min

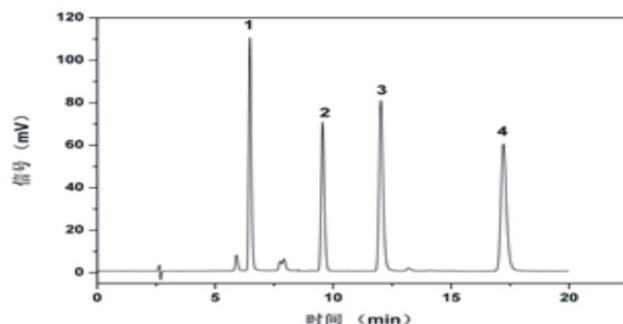
检测条件：

时间 (min)	波长 (nm)
0.00	478
8.50	520

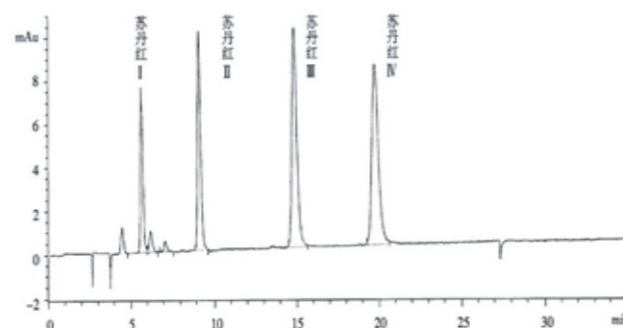
仪器与设备

EasySep™-1020型自动化高效液相色谱

Globalsil C18，4.6*250 mm，5 μ m



苏丹红分离图谱（实例）



苏丹红分离图谱（国标）

(1) 苏丹红 I，(2) 苏丹红 II，(3) 苏丹红 III，(4) 苏丹红 IV

饲料中苏丹红染料检测(二)

色谱条件

色谱柱：HALO C18，2.7 μ m，4.6x50 mm

流动相：乙腈：水=90:10

流速：1.0 mL/min

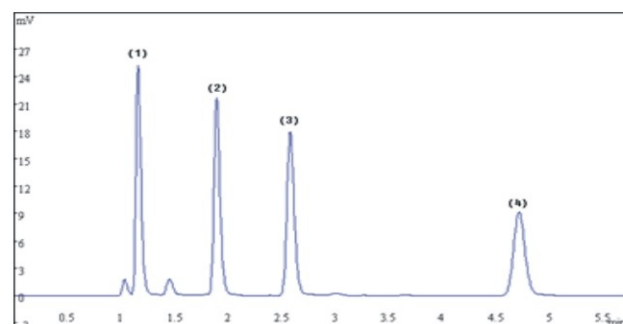
检测波长：478 nm

进样量：20 μ L

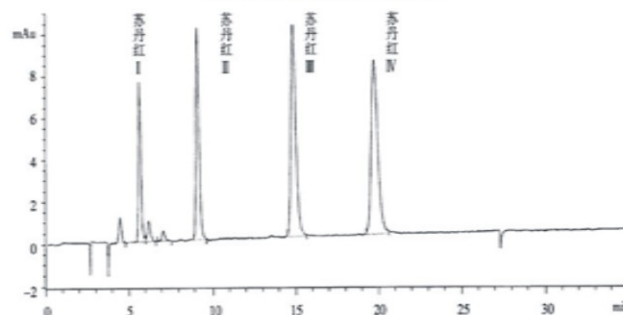
仪器与设备

EasySep™-1020型自动化高效液相色谱

HALO C18，2.7 μ m，4.6x50 mm



苏丹红分离图谱（实例）



苏丹红分离图谱（国标）

(1) 苏丹红 I，(2) 苏丹红 II，(3) 苏丹红 III，(4) 苏丹红 IV

ELSD 药典方法和实验

药典规定

	产品名	检测化合物	药典中所在页数
1	黄芪	黄芪甲苷	一部P212
2	炙黄芪	黄芪甲苷	一部P213
3	银杏叶制剂中萜类内酯	白果内酯	一部P220
4	银杏叶提取物	银杏内酯A, 银杏内酯B, 银杏内酯C, 白果内酯	一部P281
5	银杏叶片	白果内酯	一部P597
6	地肤子	地肤子皂苷lc	一部P81
7	知母	菝葜皂苷元	一部P148
8	浙贝母	贝母素甲, 贝母素乙	一部P205
9	路路通	路路通酸	一部P248
10	薏苡仁	甘油三油酸酯	一部P260
11	乙肝宁颗粒	黄芪甲苷	一部P290
12	三金片	羟基积雪草苷	一部P326
13	玉屏风口服液	黄芪甲苷	一部P409
14	补中益气丸(水丸)	黄芪甲苷	一部P480
15	硫酸卡那霉素	卡那霉素	二部P725
16	硫酸卡那霉素注射液	卡那霉素	二部P725
17	硫酸卡那霉素滴眼液	卡那霉素	二部P725
18	注射用硫酸卡那霉素	卡那霉素	二部P726
19	硫酸依替米星	依替米星	二部P741
20	硫酸依替米星注射液	依替米星	二部P741
21	注射用硫酸依替米星	依替米星	二部P742
22	硫酸庆大霉素	庆大霉素、小诺霉素	二部P731
23	硫酸庆大霉素片	庆大霉素、小诺霉素	二部P731
24	硫酸庆大霉素注射液	庆大霉素、小诺霉素	二部P731
25	硫酸庆大霉素颗粒	庆大霉素、小诺霉素	二部P732
26	硫酸庆大霉素滴眼液	庆大霉素、小诺霉素	二部P732

药典实验(1)----黄芪

药典要求(一部P212)

C18色谱柱, 流动相-乙腈: 水=32:68, 蒸发光散射检测器, 理论塔板数(以黄芪甲苷为标准)不小于4000。

实际测试情况

测试样品

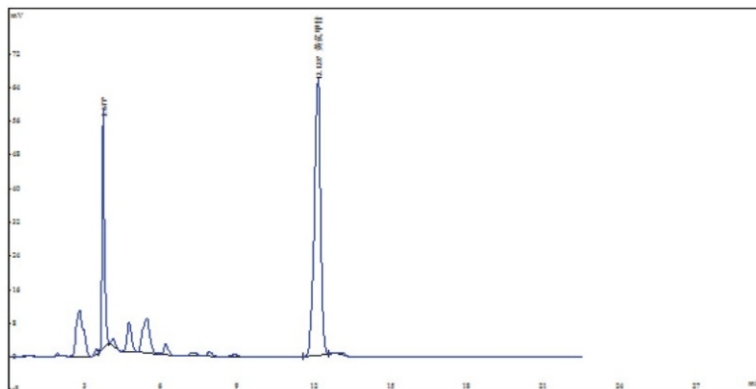
黄芪样品

色谱条件

色谱柱: C18, 5 μ m, 4.6X250 mm
 流动相: 乙腈: 水=35:65
 流速: 1.0 mL/min

ELSD 条件

载气: 压缩空气(或氮气)
 流速: 2.5 L/min
 蒸发温度: 75℃



ELSD 药典方法和实验

药典实验(2)---银杏

药典要求(一部P220)

C18色谱柱, 流动相-甲醇:四氢呋喃:水=25:10:65, 蒸发光散射检测器, 理论塔板数(以白果内酯为标准)不小于3000。

实际测试情况

测试样品

白果内酯标准对照品

色谱条件

色谱柱: C18, 250*4.6 mm, 5 μ m

流动相: 正丙醇:四氢呋喃:水=1:25:74

进样量: 10 μ L

流速: 1 mL/min

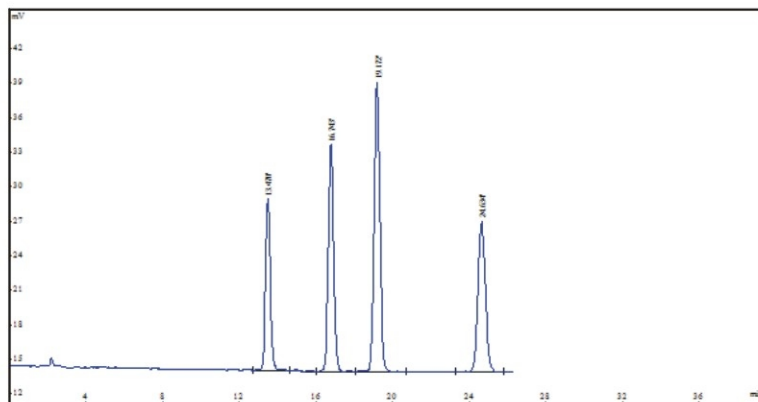
柱温: 30°C

ELSD 条件

载气: 压缩空气(或氮气)

流速: 2.5 L/min

蒸发温度: 90°C



药典实验(3)---浙贝母

药典要求(一部P205)

C18色谱柱, 流动相-乙腈:水:二乙胺=70:30:0.03, 蒸发光散射检测器, 理论塔板数按贝母素甲峰不小于2000。

实际测试情况

测试样品

浙贝母对照品

色谱条件

流动相: 乙腈:水:二乙胺=70:30:0.03

流速: 1 mL/min

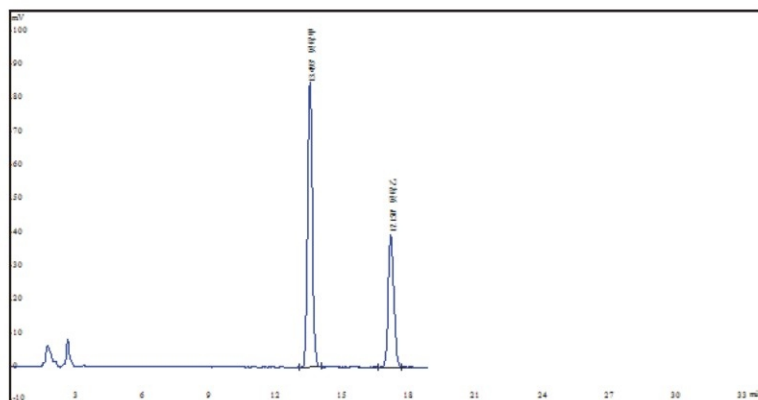
色谱柱: C18, 5 μ m, 250*4.6 mm

ELSD 条件

载气: 压缩空气(或氮气)

流速: 2.5 L/min

蒸发温度: 80°C



ELSD 药典方法和实验

药典实验(4)----知母

药典要求

C8色谱柱，流动相-乙腈：水=25:75，蒸发光散射检测器，理论板数按知母皂苷BⅡ峰计算应不低于10000。

实际测试情况

测试样品

知母样品

色谱条件

色谱柱：C8 5 μ m 250*4.6 mm

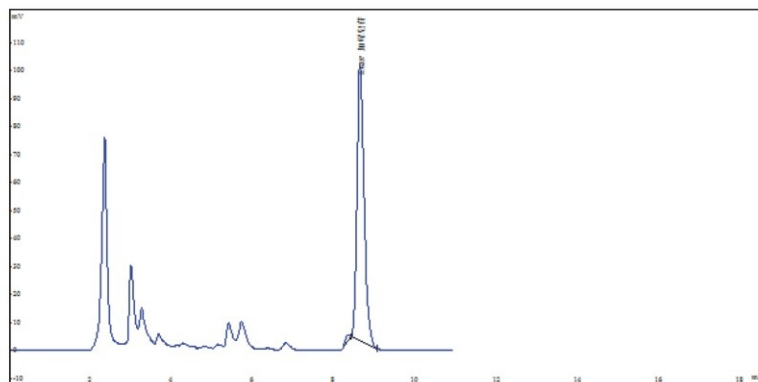
流动相：乙腈：水=25:75 流速1 mL/min

ELSD 条件

载 气：压缩空气（或氮气）

流 速：2.5 L/min

蒸发温度：75℃



药典实验(5)---- 硫酸庆大霉素

药典要求

用十八烷基硅烷键合硅胶为填充剂（pH值范围为0.8~8.0）；以0.2 mol/L三氟醋酸-甲醇（94：6）为流动相；流速为每分钟0.6 mL

实际测试情况

测试样品

硫酸庆大霉素样品

色谱条件

流动相：依据药典要求配置

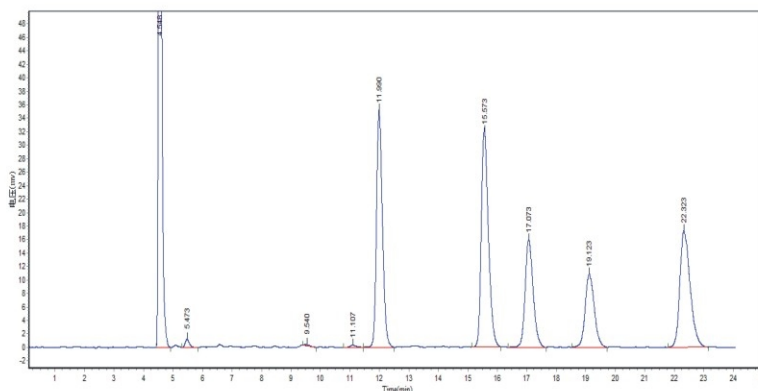
色谱柱：C18, 5 μ m, 250 * 4.6 mm

ELSD 条件

载 气：压缩空气（或氮气）

流 速：2.5 L/min

蒸发温度：90℃



ELSD 药典方法和实验

药典实验(6)---- 桔梗

药典要求

以十八烷基硅烷键合硅胶为填充剂（C18）；以乙腈-水(25：75)为流动相；蒸发光散射检测器检测；理论板数按桔梗皂苷D峰计算应不低于3000。

实际测试情况

测试样品

桔梗对照品

色谱条件

流动相：乙腈：水=30:70

流 速：1 mL/min

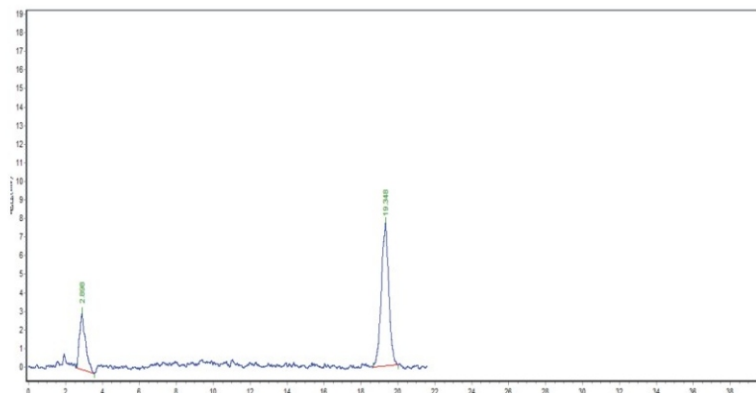
色谱柱：C18, 5 μ m, 250 * 4.6 mm

ELSD 条件

载 气：压缩空气（或氮气）

流 速：2.5 L/min

蒸发温度：75℃



药典实验(7)---- 薏苡仁

药典要求

以十八烷基硅烷键合硅胶为填充剂；以乙腈-二氯甲烷(65：35)为流动相；蒸发光散射检测器检测；理论板数按甘油三油酸酯峰计算应不低于5000。

实际测试情况

测试样品

甘油三油酸酯对照品

色谱条件

流动相：乙腈-二氯甲烷(65：35)

流 速：1 mL/min

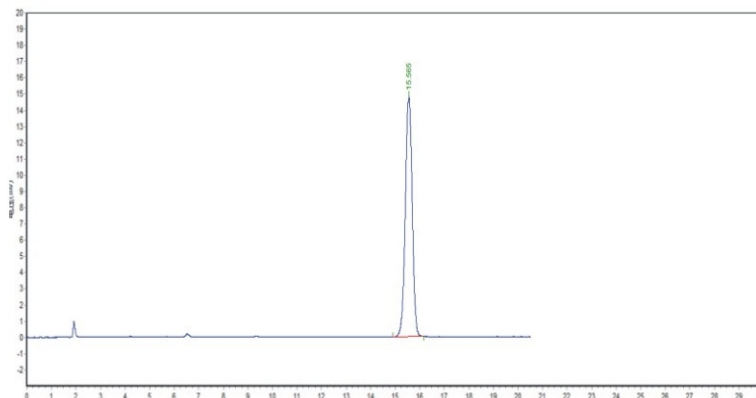
色谱柱：C18, 5 μ m, 250 * 4.6 mm

ELSD 条件

载 气：压缩空气（或氮气）

流 速：2.5 L/min

蒸发温度：80℃



ELSD 药典方法和实验

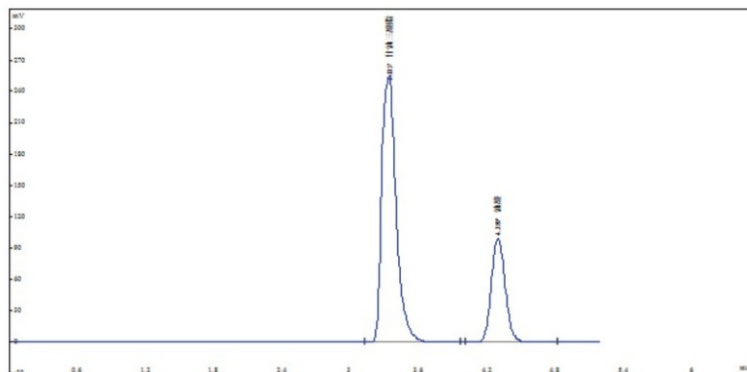
药典实验(8)---- 酯维注射液

色谱条件

色谱柱：硅胶柱，250*4.6 mm，5 μ m
流动相：正己烷：异丙醇：乙酸=98.9：1：0.1
流速：1 mL/min
柱温：室温
对照品：20 μ L

ELSD 条件

检测器：UM 3000 ELSD
蒸发温度：60°C
载气流量：2.5 L/min



药典实验(9)---- 酸枣仁

药典要求

以十八烷基硅烷键合硅胶为填充剂；以乙腈为流动相A，以水为流动相B；按下表中的规定进行梯度洗脱；蒸发光散射检测器检测，理论板数按酸枣仁皂苷A峰计算应不低于2000。

实际测试情况

测试样品

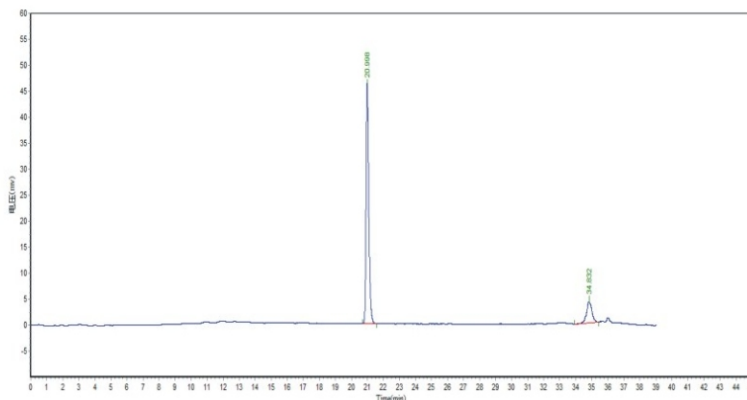
酸枣仁皂苷A对照品

色谱条件

色谱柱：C18, 5 μ m, 250 * 4.6 mm
流动相：以乙腈为流动相A，以水为流动相B
流速：1 mL/min 洗脱：梯度

ELSD 条件

载气：压缩空气（或氮气）
流速：2.5 L/min 蒸发温度：75°C



药典实验(10)---- 地肤子

药典要求

以十八烷基硅烷键合硅胶为填充剂；以甲醇-水-冰醋酸(85：15：0.2)为流动相；蒸发光散射检测器检测；理论板数按地肤子皂苷Ic峰计算应不低于3000。

实际测试情况

测试样品

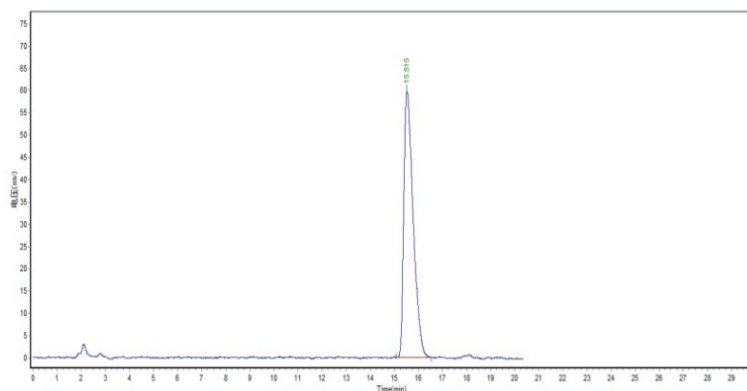
地肤子皂苷Ic对照品

色谱条件

流动相：甲醇-水-冰醋酸(85：15：0.2)
流速：1 mL/min 色谱柱：C18, 5 μ m, 250 * 4.6 mm

ELSD 条件

载气：压缩空气（或氮气）
流速：2.5 L/min 蒸发温度：80°C



九种合成食用色素检测

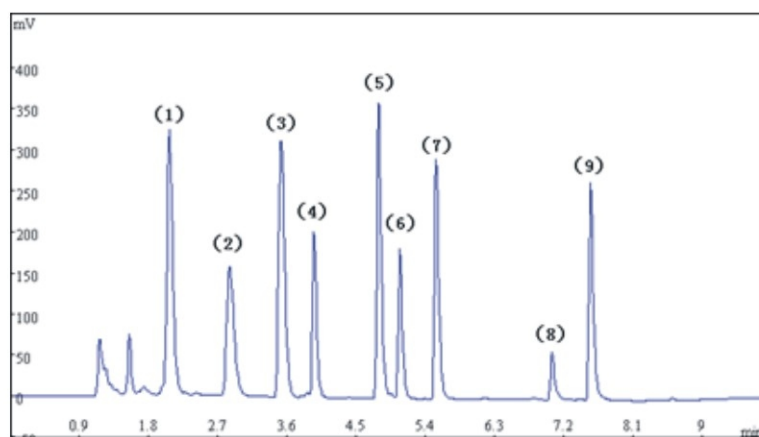
应用HALO柱，建立一种用反相高效液相色谱测定食品中9种合成食用色素的分析方法。方法采用HALO C18色谱柱（4.6×150 mm，5.0 μm），以乙腈-20 mM乙酸铵水溶液（pH 6.5）为流动相进行梯度洗脱，流速1.0 mL/min，检测波长254 nm，9种合成食用色素8 min内完成分离检测。测得合成色素的检测限介于4 ng/mL~20 ng/mL之间(S/N>2)，样品加样回收率为87.3%~101.7%。这一系统及方法操作简便快速、准确可靠，适用于食品中合成食用色素的测定。

色谱条件

色谱柱：HALO C18，5.0 μm，4.6×150 mm
流动相：溶剂A-20mM乙酸铵水溶液（pH6.5）
溶剂B-乙腈
流速：1.0 mL/min
检测波长：254 nm
进样体积：10 μL

规范性文件

GB/T 6682 分析实验室用水规格和试验方法



分离图谱（实例）

仪器与设备

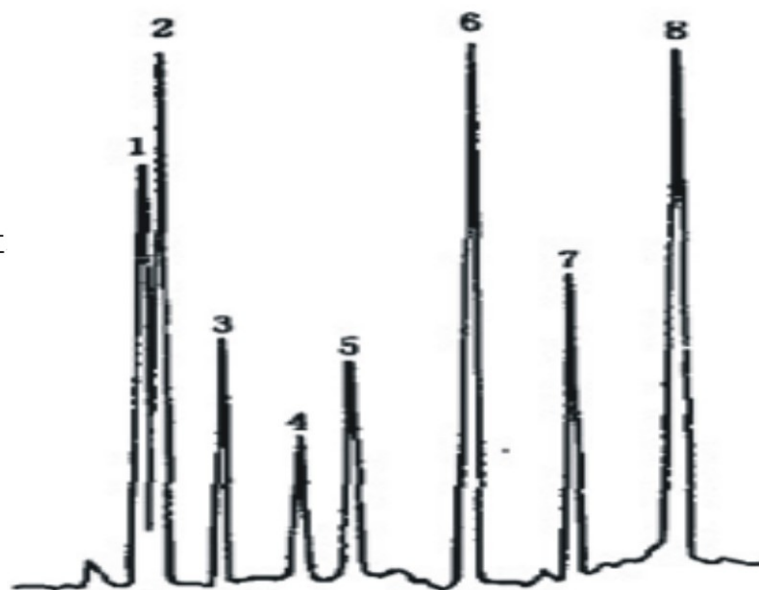
EasySep™-1020型梯度液相色谱
HALO C18色谱柱

应用范围

本方法用高效液相色谱分析合成食用色素
本方法可测定9种合成食用色素，包括柠檬黄、新红、苋菜红、靛蓝胭脂红、胭脂红、日落黄、诱惑红、亮蓝、赤藓红

注意事项

本方法测定各合成色素最低检测限不高于20 μg/L



分离图谱（国标）

(1) 柠檬黄、(2) 新红、(3) 苋菜红、(4) 靛蓝胭脂红、(5) 胭脂红、
(6) 日落黄、(7) 诱惑红、(8) 亮蓝、(9) 赤藓红

美国AMT公司新一代核-壳型HALO色谱柱 通微公司独家代理

40年来色谱填料的重大突破 引领未来色谱柱/色谱填料技术发展趋势

核壳颗粒是由著名色谱科学家 Jack Kirkland 所建立的Advanced Materials Technology (AMT) 公司于2006年研制成功的。HALO 是“核壳型”填料的始创者，该类填料最初是为了使得UHPLC色谱柱比常规 $2\mu\text{m}$ 填料UHPLC色谱柱更坚固可靠。在过去的5年时间里，核壳技术被证明非常有效，因此衍生出了多种不同的品牌和固定相类别。

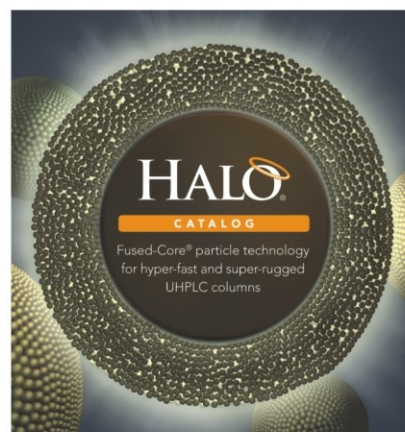
熔融核技术是由杰克柯克兰(J.J.Kirkland)所发明的。柯克兰博士被公认为是HPLC的创建者之一，他对色谱学的研究和贡献被人们广泛认同。他发表了超过150篇研究论文和6本书籍、拥有30项专利、在色谱领域已经获得了很多著名奖项。

尽管UHPLC 目前发展很快，但是其昂贵的成本和复杂性，加上目前大部分已经安装的传统HPLC设备，意味着在未来的一段时间里，HPLC依然是液相色谱分离的主流方法。为了满足目前对HPLC 性能提升的需求，HALO色谱柱可以让普通HPLC轻松实现UPLC的性能。



HPLC泰斗J.J.Kirkland最新力作！

- ◆ 创新的Fused-Core (核壳或熔融) 技术：将多孔硅壳熔融到实心的硅核上面。
- ◆ 超快速度！
- ◆ 超高柱效！
- ◆ 超强使用寿命！
- ◆ HALO- $2.7\mu\text{m}$ ，HALO- $5\mu\text{m}$ 多种产品可选！
- ◆ 让普通HPLC轻松实现UPLC的性能！
- ◆ 让UPLC提高分离能力，加快分析速度，更耐用！
- ◆ 让LC-MS具有更高灵敏度！



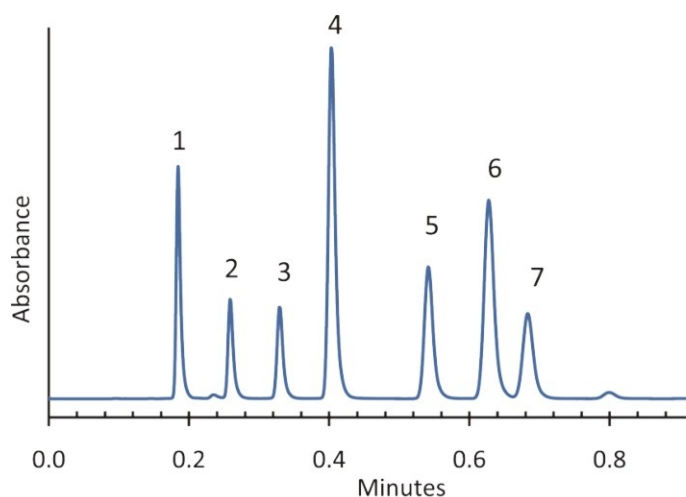
“这个快速高效液相色谱技术就色谱性能方面可与超高压液相色谱(UHPLC)相媲美，却既没有要求添置昂贵的超高压实验室仪器设备也没有要求开发新的实验室方法。” American Laboratory 评论

仅更换一根HALO色谱柱，相同的分离效果，超快的分离速度！

色谱柱	规格	流速	分析时间	乙腈用量	节省的乙腈
常规 C18柱, $5\mu\text{m}$	4.6 * 250 mm	1 mL/min	43 min	15 mL	
Halo C18柱, $2.7\mu\text{m}$	4.6 * 100 mm	1 mL/min	10 min	3.5 mL	77%

Isocratic Separation of Anilines on HALO C18

HALO C18 快速分离苯胺类化合物



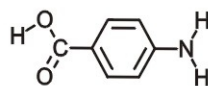
PEAK IDENTITIES:

1. p-Aminobenzoic acid (对氨基苯甲酸)
2. 1, 2-Phenylenediamine (邻苯二胺)
3. p-Anisidine (对氨基苯甲醚)
4. Aniline (苯胺)
5. 3-Nitroaniline (间硝基苯胺)
6. 2-Nitroaniline (邻硝基苯胺)
7. 4-Chloroaniline (对氯苯胺)

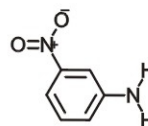
TEST CONDITIONS:

Column: HALO C18, 4.6 x 50 mm
 Part Number: 92814-402
 Mobile Phase: 60/40– A/B
 A=0.02 M sodium phosphate buffer, pH=7.0
 B= Acetonitrile
 Flow Rate: 2.0 mL/min.
 Pressure: 211 Bar
 Temperature: 25°C
 Detection: UV 254 nm, VWD
 Injection Volume: 1.0 µL
 Sample Solvent: ACN/ water-50/50
 Response Time: 0.02 sec.
 Flow Cell: 2.5 µL semi-micro
 LC System: Shimadzu Prominence UFLC XR
 Extra column volume: ~14 µL

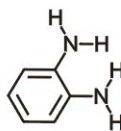
STRUCTURES:



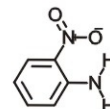
p-Aminobenzoic acid



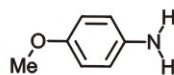
3-Nitroaniline



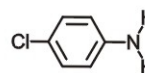
1,2-phenylenediamine



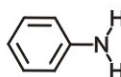
2-Nitroaniline



p-Anisidine



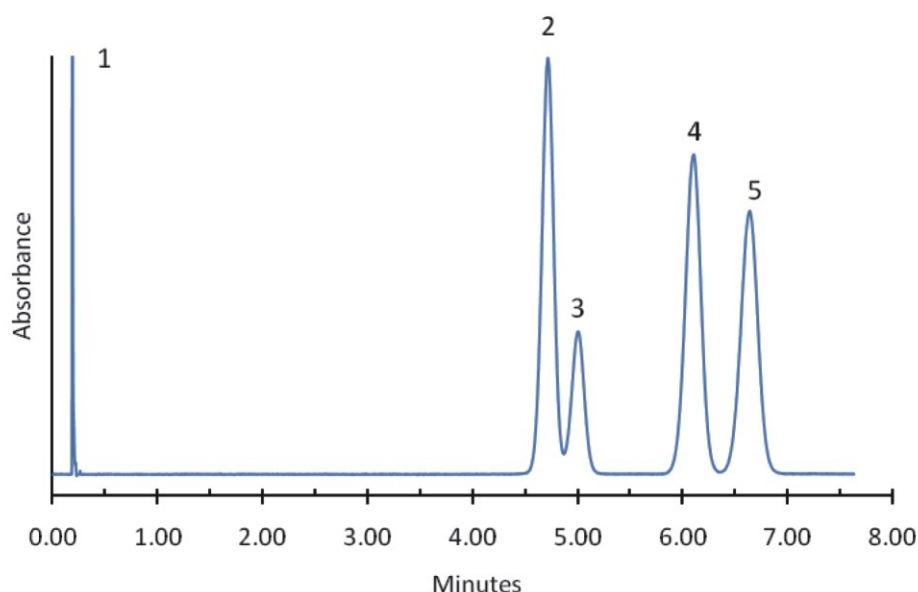
4-Chloroaniline



Aniline

Application Note: 35-EX

Isocratic Separation of Dinitrotoluenes on HALO RP-Amide Phase HALO RP-Amide 色谱柱快速等度分离二硝基甲苯类化合物



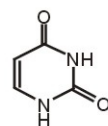
PEAK IDENTITIES:

1. Uracil (尿嘧啶)
2. 2,4-dinitrotoluene (2,4-二硝基甲苯)
3. 2,6-dinitrotoluene (2,6-二硝基甲苯)
4. 3,4-dinitrotoluene (3,4-二硝基甲苯)
5. 2,3-dinitrotoluene (2,3-二硝基甲苯)

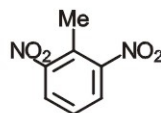
TEST CONDITIONS:

Column: 4.6 x 50 mm, HALO RP-Amide
Part Number: 92814-407
Mobile Phase: 80/20-Water/Acetonitrile
Flow Rate: 2.5 mL/min.
Pressure: 257 Bar
Temperature: 27 °C
Detection: UV 254 nm, VWD
Injection Volume: 1.0 µL
Sample Solvent: 50/50-Methanol/Acetonitrile
Response Time: 0.02 sec.
Flow Cell: 2.5 µL semi-micro
LC System: Shimadzu Prominence UFLC XR
Extra column volume: ~14 µL

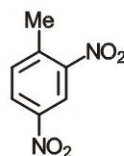
STRUCTURES



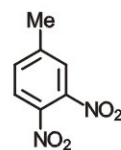
Uracil



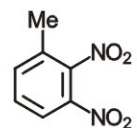
2,6-Dinitrotoluene



2,4-Dinitrotoluene



3,4-Dinitrotoluene



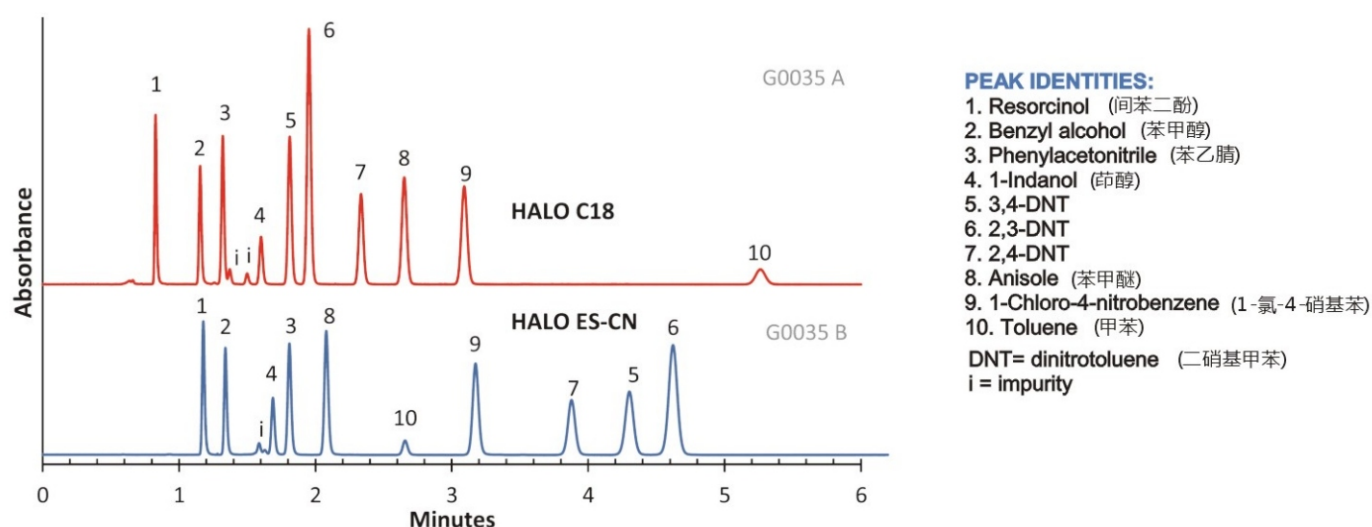
2,3-Dinitrotoluene

These dinitrotoluene isomers are difficult to separate, but can be separated with near baseline resolution in under 7 minutes using a HALO RP-Amide column.

Application Note: 53-G

Separation of Mixed Polarity Compounds on HALO C18 and ES-CN

HALO C18 和 ES-CN 色谱柱快速分离混合极性化合物



TEST CONDITIONS:

Column: 4.6 x 100 mm, HALO C18, ES-CN

Part Numbers: C18=92814-402

ES-CN=92814-404

Mobile Phase: 40/60-A/B for C18

50/50-A/B for ES-CN

A=water

B=methanol

Flow Rate: 1.25 mL/min.

Pressure: About 300 Bar

Temperature: 30 °C

Detection: UV 254 nm, VWD

Injection Volume: 1.0 µL

Sample Solvent: water/methanol

Response Time: 0.02 sec.

Flow Cell: 2.5 µL semi-micro

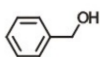
LC System: Shimadzu Prominence UFLC XR

Extra column volume: ~14 µL

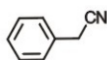
STRUCTURES:



Resorcinol



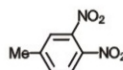
Benzyl alcohol



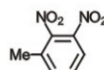
Phenylacetonitrile



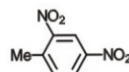
1-Indanol



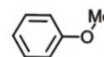
3,4-DNT



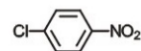
2,3-DNT



2,4-DNT



Anisole



1-Chloro-4-nitrobenzene

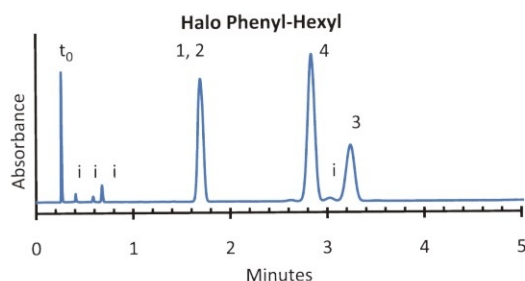
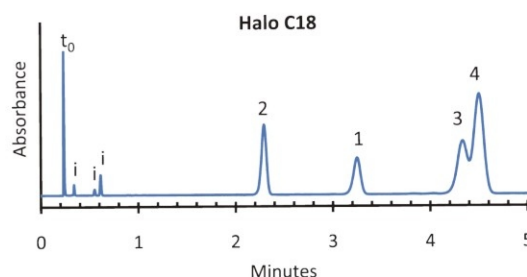
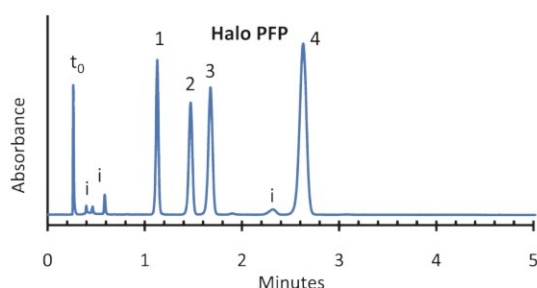


Toluene

These separations of polar and non-polar compounds show significant differences in selectivity between HALO C18 and ES-CN stationary phases. Note the increased retention of nitro compounds and reduced retention of non-polar compounds on HALO ES-CN phase.

Application Note: 23-N

Separation of Neutral Aromatics on HALO PFP, C18 and Phenyl-Hexyl HALO PFP, C18 和苯基色谱柱分离芳香化合物对比



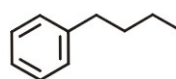
PEAK IDENTITIES:

1. Butylbenzene (丁基苯)
 2. Acenaphthene (萵)
 3. 1-Phenylnaphthalene (1-苯基萘)
 4. Pyrene (苊)
- i=impurities

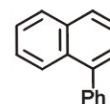
TEST CONDITIONS:

Column: 4.6 x 50 mm, HALO PFP, C18, Phenyl-Hexyl
 Part Numbers: 92814-409, -402, -406, resp.
 Mobile Phase: 30/70-water/methanol
 Flow Rate: 2.0 mL/min.
 Pressure: approximately 250 Bar
 Temperature: 40 °C
 Detection: UV 254 nm, VWD
 Injection Volume: 1.0 µL
 Sample Solvent: methanol
 Response Time: 0.02 sec.
 Flow Cell: 2.5 µL semi-micro
 LC System: Shimadzu Prominence UFLC XR
 Extra column volume: ~14 µL

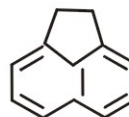
STRUCTURES:



Butylbenzene



1-Phenylnaphthalene



Acenaphthene



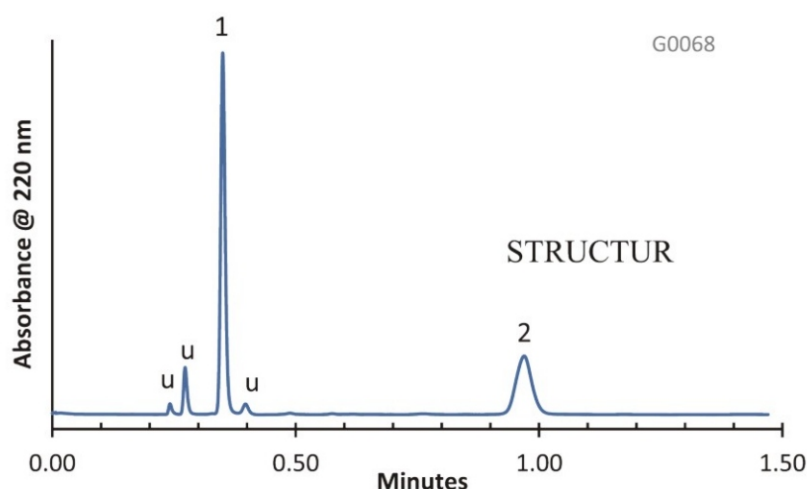
Pyrene

The separation of non-polar aromatic compounds on these three Halo bonded phases under the same conditions show differences in selectivity that can be utilized in optimizing difficult separations.

Application Note: 085-PS

Separation of Galanthamine and Quetiapine on HALO PFP (pentafluorophenyl) Phase

HALO PFP (五氟苯基) 色谱柱快速分离雪花胺和喹硫平



PEAK IDENTITIES:

1. Galanthamine (雪花胺)

2. Quetiapine (喹硫平)

u=unknown

TEST CONDITIONS:

Column: 4.6 x 50 mm, HALO PFP

Part Number: 92814-409

Mobile Phase: 58/42: A/B

A= 0.02 M Potassium phosphate, pH=3

B= Acetonitrile

Flow Rate: 1.8 mL/min.

Pressure: 155 Bar

Temperature: 40°C

Detection: UV 220 nm, VWD

Injection Volume: 0.5 µL

Sample Solvent: Methanol

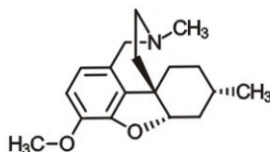
Response Time: 0.02 sec.

Flow Cell: 2.5 µL semi-micro

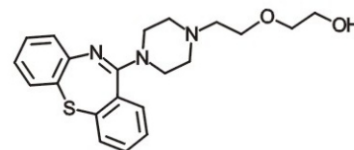
LC System: Shimadzu Prominence UFLC XR

ECV: ~14 µL

STRUCTURES:



Galanthamine



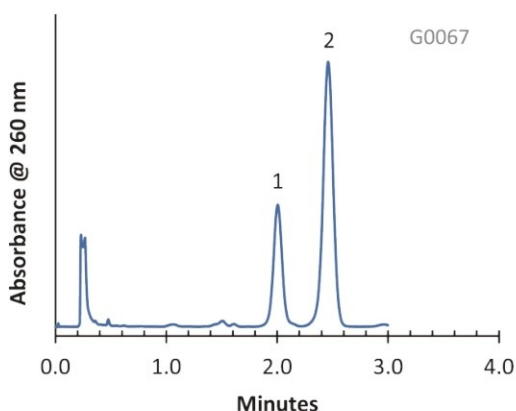
Quetiapine

These psychiatric drugs can be rapidly separated on a HALO PFP column in just one minute.

Application Note: 084-FL

HPLC Separation of Hesperidin and Diosmin on HALO-5 PFP Phase

HALO-5 PFP色谱柱快速分离橙皮素和香叶木甙



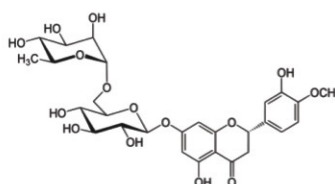
PEAK IDENTITIES:

1. Hesperidin (橙皮素)
2. Diosmin (香叶木甙)

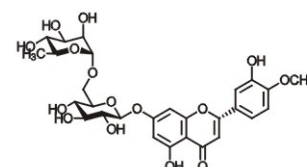
TEST CONDITIONS:

Column: 3.0 x 50 mm, HALO-5 PFP
 Part Number: 95813-409
 Mobile Phase: 85/15: A/B
 A= 0.02 M Potassium phosphate buffer, pH=3
 B= Acetonitrile
 Flow Rate: 1.0 mL/min.
 Pressure: 92 Bar
 Temperature: 30°C
 Detection: UV 260 nm, VWD
 Injection Volume: 0.5 µL
 Sample Solvent: Dimethylformamide*
 Response Time: 0.02 sec.
 Flow Cell: 2.5 µL semi-micro
 LC System: Shimadzu Prominence UFLC XR
 ECV: ~14 µL

STRUCTURES:



Hesperidin



Diosmin

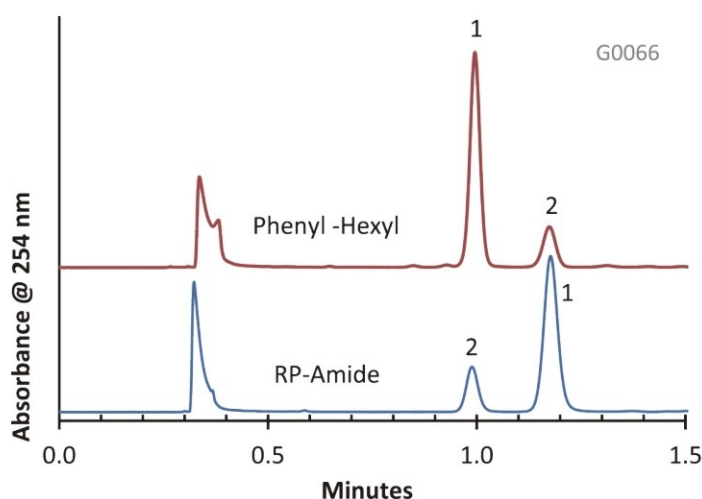
These two semisynthetic flavonoids can be rapidly separated using HALO-5 PFP (pentafluorophenyl) stationary phase at a low pressure. Note that just the addition of a double bond results in a difference that allows these two very similar compounds to be separated.

*Needed for solubility reasons.

Application Note: 083-FL

Separation of Diosmin and Hesperidin on HALO Phenyl-Hexyl and HALO RP-Amide

HALO 苯基柱和 HALO RP-Amide 色谱柱快速分离香叶木甙和橙皮素



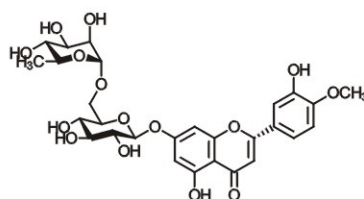
PEAK IDENTITIES:

1. Diosmin (香叶木甙)
2. Hesperidin (橙皮素)

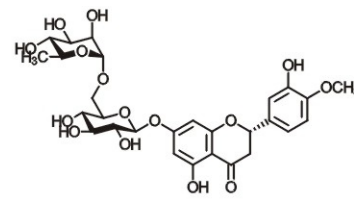
TEST CONDITIONS:

Column 1: 4.6 x 50 mm, HALO Phenyl-Hexyl
 Part Number: 92814-406
 Column 2: 4.6 x 50 mm, HALO RP Amide
 Part Number: 92814-407
 Mobile Phase: 78/22: Water/acetonitrile
 Flow Rate: 1.5 mL/min.
 Pressure: 145 Bar
 Temperature: 40°C
 Detection: UV 254 nm, VWD
 Injection Volume: 0.5 µL
 Sample Solvent: Dimethylformamide*
 Response Time: 0.02 sec.
 Flow Cell: 2.5 µL semi-micro
 LC System: Shimadzu Prominence UFLC XR
 ECV: ~14 µL

STRUCTURES:



Diosmin



Hesperidin

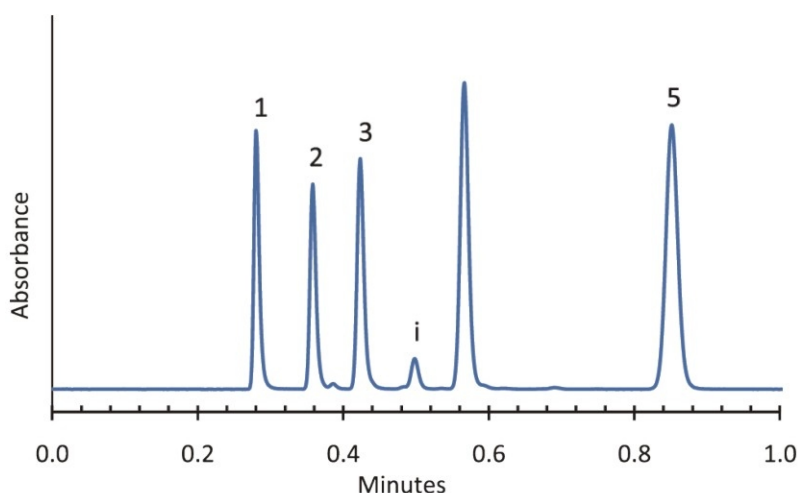
These two semi-synthetic flavonoids are often taken to enhance vascular health. The two compounds may be easily separated using either HALO RP-Amide or HALO Phenyl-Hexyl phases. Note the difference in elution order on the two phases.

*Needed for solubility reasons.

Application Note: 24-P

Isocratic Separation of Phthalate Esters on HALO C18

HALO C18 快速分离邻苯二甲酸酯类化合物



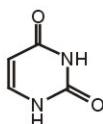
PEAK IDENTITIES:

1. Uracyl (尿嘧啶)
2. Dimethylphthalate (邻苯二甲酸二甲酯)
3. Diethylphthalate (邻苯二甲酸二乙酯)
- i=impurity
4. Di-n-propylphthalate (邻苯二甲酸二异丙酯)
5. Di-n-butylphthalate (邻苯二甲酸二异丁酯)

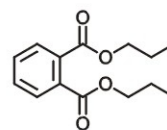
TEST CONDITIONS:

Column: 4.6 x 50 mm, HALO C18
 Part Number: 92814-402
 Mobile Phase: 20/80 A/B
 A=water
 B= acetonitrile
 Flow Rate: 1.5 mL/min.
 Pressure: 97 Bar
 Temperature: 27°C
 Detection: UV 254 nm, VWD
 Injection Volume: 0.5 µL
 Sample Solvent: acetonitrile
 Response Time: 0.02 sec.
 Flow Cell: 2.5 µL semi-micro
 LC System: Shimadzu Prominence UFLC XR
 Extra column volume: ~14 µL

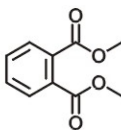
STRUCTURES:



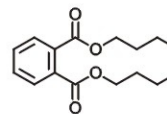
Uracyl



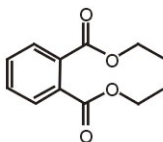
Di-n-propylphthalate



Dimethylphthalate



Di-n-butylphthalate

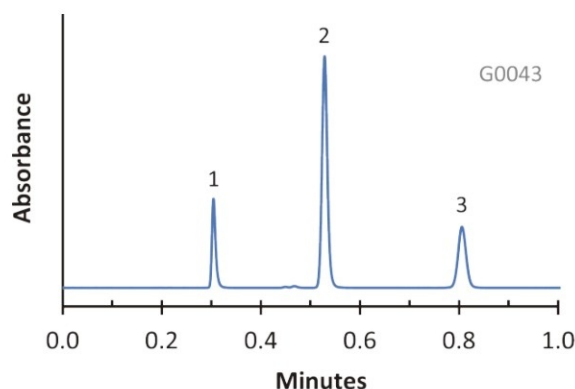


Diethylphthalate

Application Note: 61-CB

Separation of Carbamate Pesticides on HALO C18 Phase

HALO C18 色谱柱快速分离氨基甲酸酯类杀虫剂



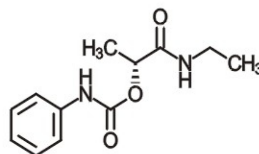
PEAK IDENTITIES:

1. Carbetamide (长杀草)
2. Prothion (苯胺灵)
3. Chlorprothion (氯苯胺灵)

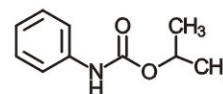
TEST CONDITIONS:

Column: 4.6 x 50 mm, HALO C18
Part Number: 92814-402
Mobile Phase: 40/60-A/B
A= Water
B=Acetonitrile
Flow Rate: 2.0 mL/min.
Pressure: 130 Bar
Temperature: 30 °C
Detection: UV 240 nm, VWD
Injection Volume: 0.2 µL
Sample Solvent: Acetonitrile
Response Time: 0.02 sec.
Flow Cell: 2.5 µL semi-micro
LC System: Shimadzu Prominence UFLC XR
Extra column volume: ~14 µL

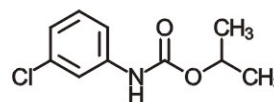
STRUCTURES:



Carbetamide



Prothion

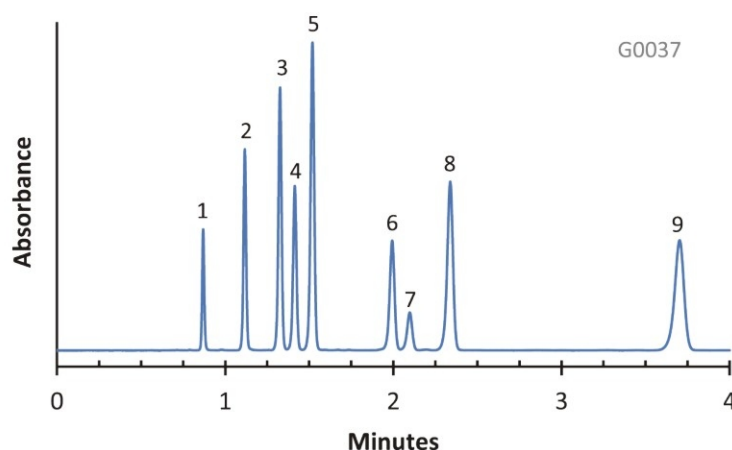


Chlorprothion

This separation illustrates a rapid HPLC determination of three carbamate pesticides on HALO C18 phase in just under a minute. The unique Fused-Core technology allows the use of high flow rates at moderate pressures while retaining high efficiency.

Application Note: 55-PU

Separation of Phenyl Urea Pesticides on HALO Phenyl-Hexyl Phase HALO 苯基 - 己基相快速分离苯基脲农药



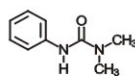
PEAK IDENTITIES:

1. Fenuron (非草隆)
2. Monuron (灭草隆)
3. Fluomethuron (伏草隆)
4. Isoproturon (异丙隆)
5. Diuron (敌草隆)
6. Siduron A (环草隆A)
7. Siduron B (环草隆B)
8. Linuron (利谷隆)
9. Neburon (草不隆)

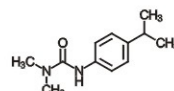
TEST CONDITIONS:

Column: 4.6 x 100 mm, HALO Phenyl-Hexyl
Part Number: 92814-606
Mobile Phase: 50/50-A/B
A= 0.025 M Potassium phosphate buffer, adj. to pH = 2.5
B=Acetonitrile
Flow Rate: 1.5 mL/min.
Pressure:220 Bar
Temperature: 30 °C
Detection: UV 245 nm, VWD
Injection Volume: 0.5 µL
Sample Solvent: Acetonitrile
Response Time: 0.02 sec.
Flow Cell: 2.5 µL semi-micro
LC System: Shimadzu Prominence UFLC XR

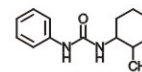
STRUCTURES:



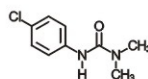
Fenuron



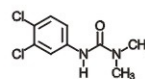
Isoproturon



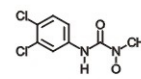
Siduron B



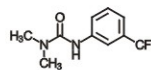
Monuron



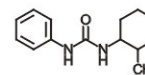
Diuron



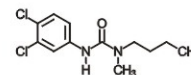
Linuron



Fluomethuron



Siduron A



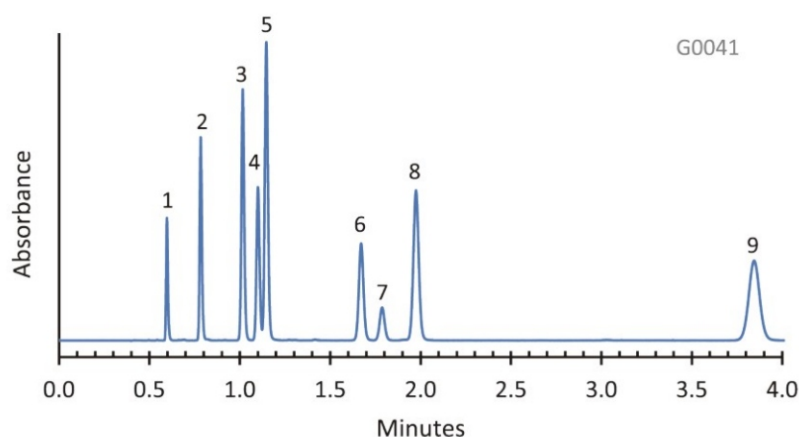
Neburon

This separation illustrates the use of the highly efficient HALO Fused-Core Phenyl-Hexyl stationary phase in the analysis of common herbicides. The short run times allow analyses using isocratic conditions so that column equilibration time is not required between runs.

Application Note: 59-PU

Separation of Phenyl Urea Pesticides on HALO C18 Phase

HALO C18 色谱柱快速分离苯基脲类杀虫剂



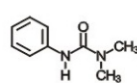
PEAK IDENTITIES:

1. Fenuron (非草隆)
2. Monuron (灭草隆)
3. Fluomethuron (伏草隆)
4. Isoproturon (异丙隆)
5. Diuron (敌草隆)
6. Siduron A (环草隆A)
7. Siduron B (环草隆B)
8. Linuron (利谷隆)
9. Neburon (草不隆)

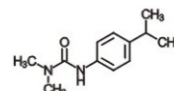
TEST CONDITIONS:

Column: 4.6 x 100 mm, HALO C18
 Part Number: 92814-602
 Mobile Phase: 50/50-A/B
 A= 0.025 M Potassium phosphate buffer, adj. to pH = 2.5
 B=Acetonitrile
 Flow Rate: 2.0 mL/min.
 Pressure: 300 Bar
 Temperature: 30 °C
 Detection: UV 245 nm, VWD
 Injection Volume: 0.5 µL
 Sample Solvent: Acetonitrile
 Response Time: 0.02 sec.
 Flow Cell: 2.5 µL semi-micro
 LC System: Shimadzu Prominence UFLC XR

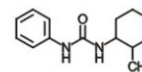
STRUCTURES:



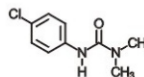
Fenuron



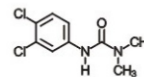
Isoproturon



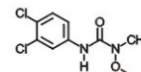
Siduron B



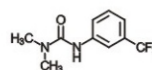
Monuron



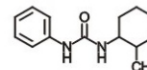
Diuron



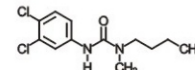
Linuron



Fluomethuron



Siduron A



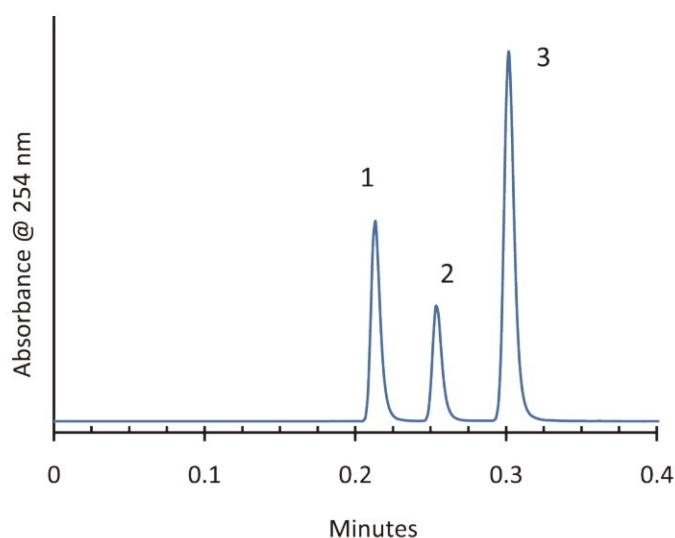
Neburon

This separation illustrates the use of the highly efficient 2.7 µm HALO Fused-Core C18 stationary phase in the analysis of some popular herbicides. The short run times allow analyses using isocratic conditions so that column equilibration time is not required between runs.

Application Note: 18-P

Separation of Vanillins on HALO C-18

HALO C-18快速分离香兰素



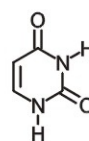
PEAK IDENTITIES:

1. Uracil (尿嘧啶)
2. Vanillin (香兰素)
3. o-Vanillin (邻香兰素)

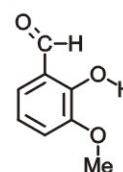
TEST CONDITIONS:

Column: 4.6 x 50 mm, HALO C-18
 Part Number: 92814-402
 Mobile Phase: 35/65-- A/B
 A=water B= acetonitrile
 Flow Rate: 2.0 mL/min.
 Pressure: 166 Bar
 Temperature: 30°C
 Detection: UV 254 nm, VWD
 Injection Volume: 0.5 µL
 Sample Solvent: methanol
 Response Time: 0.02 sec.
 Flow Cell: 2.5 µL semi-micro
 LC System: Shimadzu Prominence UFLC XR
 Extra column volume: ~14 µL

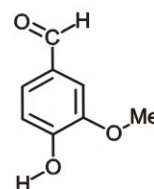
STRUCTURES:



Uracil



o-Vanillin

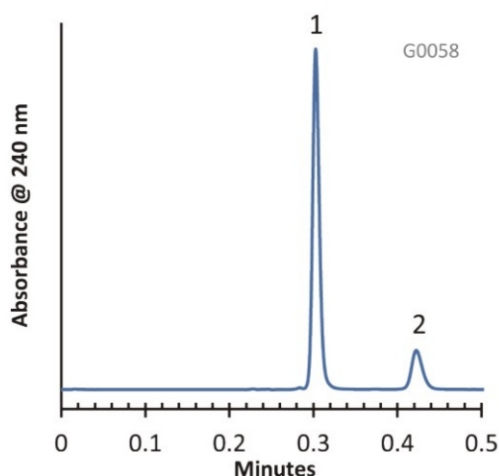


Vanillin

HPLC Application Note: 075-AB

Separation of Amoxicillin and Ampicillin on HALO RP-Amide

HALO RP-Amide 快速分离阿莫西林和氨苄西林



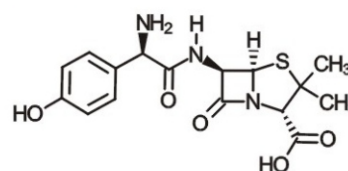
PEAK IDENTITIES:

1. Amoxicillin (阿莫西林)
2. Ampicillin (氨苄西林)

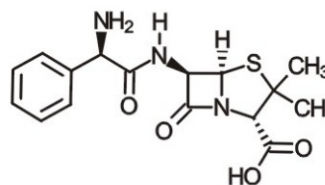
TEST CONDITIONS:

Column: 4.6 x 50 mm, HALO RP-Amide
Part Number: 92814-407
Mobile Phase: 82/18: A/B
A= 0.02 M Phosphate buffer, pH=2.7
B= Acetonitrile
Flow Rate: 2.0 mL/min.
Pressure: 200 Bar
Temperature: 30°C
Detection: UV 240 nm, VWD
Injection Volume: 1.0 µL
Sample Solvent: 80/20: water/acetonitrile
Response Time: 0.02 sec.
Flow Cell: 2.5 µL semi-micro
LC System: Shimadzu Prominence UFLC XR
ECV: ~14 µL

STRUCTURES:



Amoxicillin



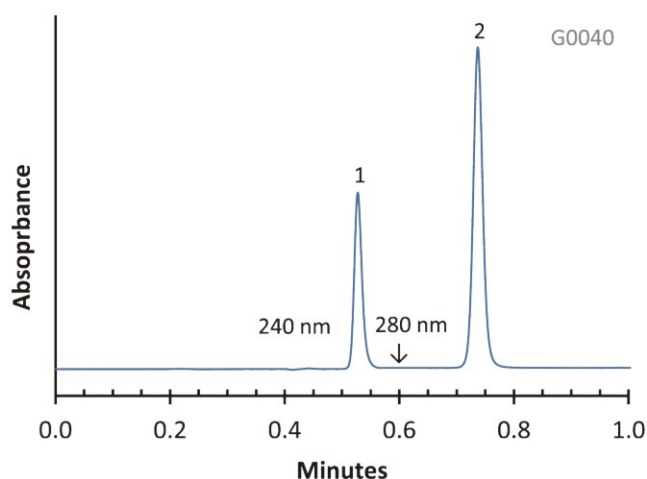
Ampicillin

This chromatogram shows a time-efficient separation of two weakly retained antibiotics on a short HALO RP-Amide column.

Application Note: 58-AM

Isocratic Separation of Amphenicols on HALO RP-Amide Phase

HALO RP-Amide 色谱柱快速分离酰胺醇类化合物



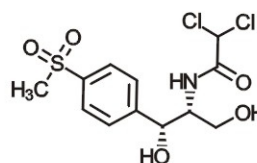
PEAK IDENTITIES:

1. Thiamphenicol (甲磺霉素)
2. Chloramphenicol (氯霉素)

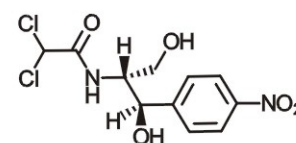
TEST CONDITIONS:

Column: 4.6 x 50 mm, HALO RP-Amide
 Part Number: 92814-406
 Mobile Phase: 55/45-A/B
 A= 0.025 M Ammonium acetate buffer, pH=5.8
 B=Acetonitrile
 Flow Rate: 1.0 mL/min.
 Pressure: 92 Bar
 Temperature: 35 °C
 Detection: UV 240/280 nm, VWD
 Injection Volume: 0.5 µL
 Sample Solvent: Acetonitrile
 Response Time: 0.02 sec.
 Flow Cell: 2.5 µL semi-micro
 LC System: Shimadzu Prominence UFLC XR
 Extra column volume: ~14 µL

STRUCTURES:



Thiamphenicol



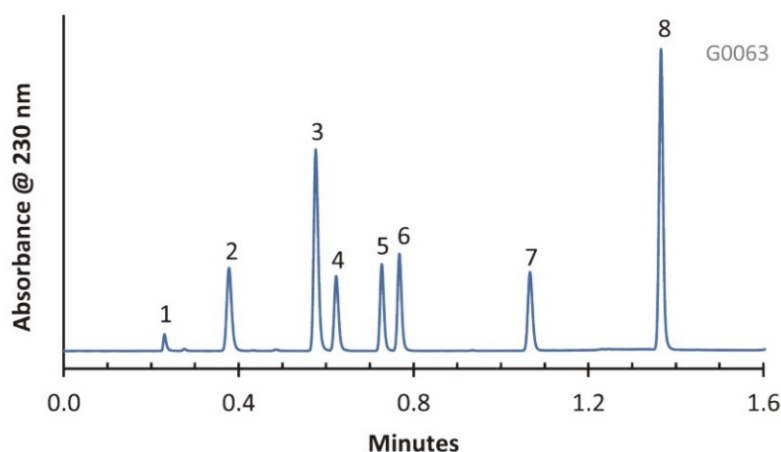
Chloramphenicol

This separation shows a rapid HPLC method for the analysis of amphenicols using HALO RP-Amide phase. To improve the sensitivity of detection the first peak was monitored @ 240 nm and the second @ 280 nm.

Application Note: 080-AF

Separation of Antibiotic and Antifungal Drugs on HALO RP-Amide

HALO RP-Amide 色谱柱快速分离抗生素和抗真菌类药物



PEAK IDENTITIES:

1. Unknown
2. Ketoconazole (酮康唑)
3. Naftifine (萘替芬)
4. Clotrimazole (克霉唑)
5. Econazole (益康唑)
6. Sulconazole (硫康唑)
7. Clofazimine (氯法齐明)
8. Tolnaftate (托萘酯)

TEST CONDITIONS:

Column: 4.6 x 50 mm, HALO RP-Amide

Part Number: 92814-407

Mobile Phase: Gradient

A= 0.02 M Potassium phosphate buffer, pH=3

B= Acetonitrile

Gradient: Time	%B
0.0	41
1.0	80
1.6	80

Flow Rate: 2.0 mL/min.

Pressure: 188 Bar at start of gradient

Temperature: 35°C

Detection: UV 230 nm, VWD

Injection Volume: 0.3 µL

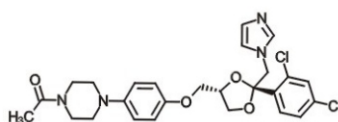
Sample Solvent: water/acetonitrile-25/75

Response Time: 0.02 sec.

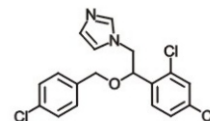
Flow Cell: 2.5 µL semi-micro

LC System: Shimadzu Prominence UFLC XR

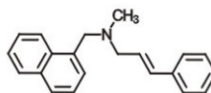
STRUCTURES:



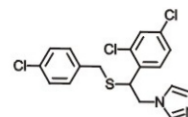
Ketoconazole



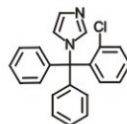
Econazole



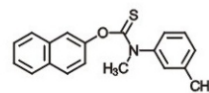
Naftifine



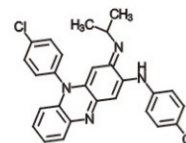
Sulconazole



Clotrimazole



Tolnaftate

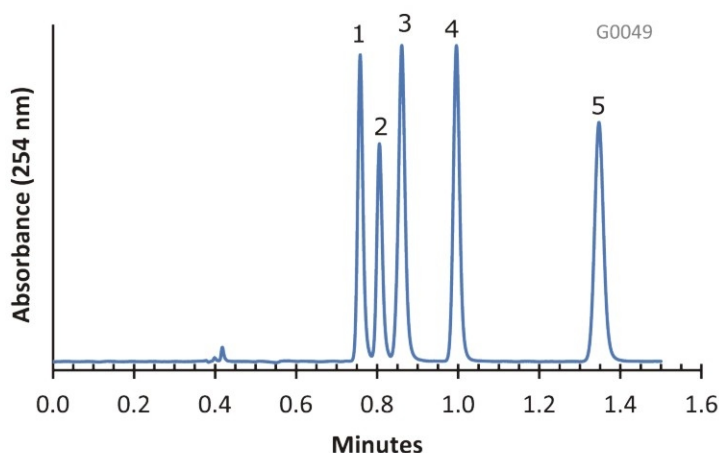


Clofazimine

The antimicrobial drug clofazimine and the antifungal drugs can be rapidly analyzed using the HALO RP-Amide column under gradient conditions with low back pressure.

Application Note: 067-AD

Separation of Antidepressants on HALO Penta-HILIC HALO Penta-HILIC 色谱柱快速分离抗抑郁类药物



PEAK IDENTITIES:

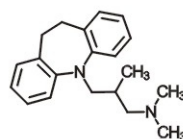
1. Trimipramine (三甲丙咪嗪)
2. Amitriptyline (阿米替林)
3. Doxepin (多虑平)
4. Nortriptyline (去甲替林)
5. Amoxapine (阿莫沙平)

TEST CONDITIONS:

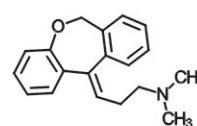
Column: 4.6 x 100 mm, HALO Penta-HILIC
 Part Number: 92814-605
 Mobile Phase: 7/93: A/B
 A= 0.1 M Ammonium formate, pH=3.5 (adj.)
 B= Acetonitrile
 Flow Rate: 2.5 mL/min.
 Pressure: 165 Bar
 Temperature: 30°C
 Detection: UV 254 nm, VWD
 Injection Volume: 0.5 µL
 Sample Solvent: 10/90: Water/Acetonitrile
 Response Time: 0.02 sec.
 Flow Cell: 2.5 µL semi-micro
 LC System: Shimadzu Prominence UFLC XR
 ECV: ~14 µL

Basic drugs such as antidepressants can be separated rapidly under HILIC conditions with good peak shape using HALO Penta-HILIC stationary phase.

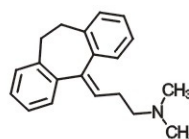
STRUCTURES:



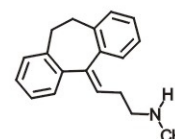
Trimipramine



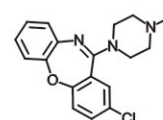
Doxepin



Amitriptyline



Nortriptyline

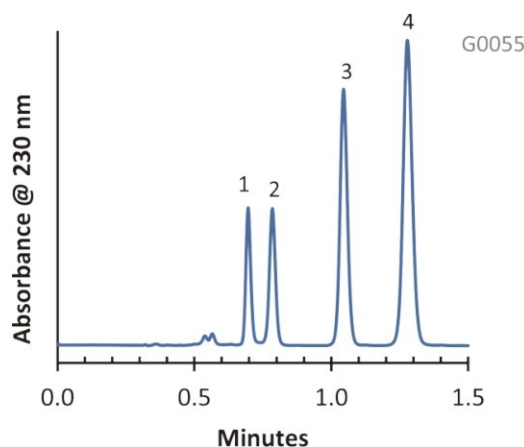


Amoxapine

HPLC Application Note: 72-AB

Separation of Penicillins on HALO Phenyl-Hexyl

HALO 苯基色谱柱快速分离青霉素类药物



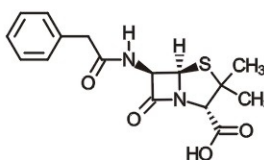
PEAK IDENTITIES:

1. Penicillin G (青霉素G)
2. Piperacillin (哌拉西林)
3. Oxacillin (苯唑西林)
4. Cloxacillin (氯唑西林)

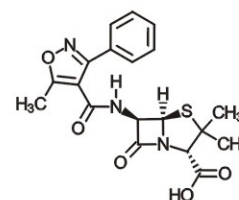
TEST CONDITIONS:

Column: 4.6 x 50 mm, HALO Phenyl-Hexyl
 Part Number: 92814-406
 Mobile Phase: 40/60: A/B
 A= 0.02 M Phosphate buffer, pH=3.0 (adj.)
 B= Methanol
 Flow Rate: 1.5 mL/min.
 Pressure: 200 Bar
 Temperature: 40°C
 Detection: UV 230 nm, VWD
 Injection Volume: 1.0 µL
 Sample Solvent: 50/50 Water/acetonitrile
 Response Time: 0.02 sec.
 Flow Cell: 2.5 µL semi-micro
 LC System: Shimadzu Prominence UFLC XR
 ECV: about 14 µL

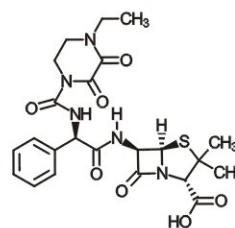
STRUCTURES:



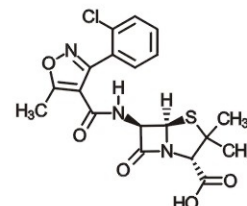
Penicillin G



Oxacillin



Piperacillin

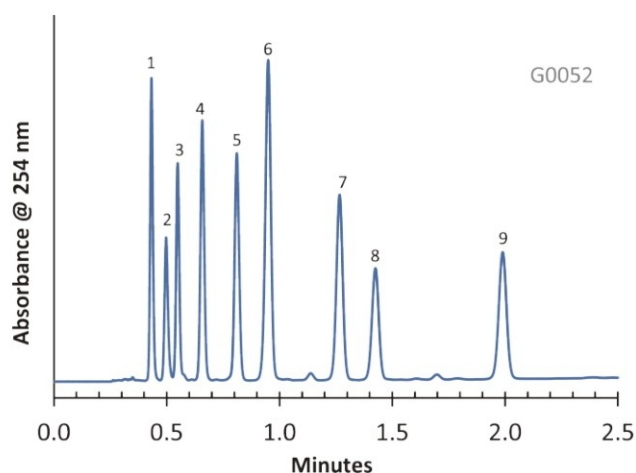


Cloxacillin

These four penicillin drugs can be rapidly separated on HALO Fused-Core Phenyl-Hexyl bonded phase columns.

HPLC Application Note: 69-AB

Separation of Cephalosporins on HALO ES-CN HALO ES-CN 色谱柱快速分离头孢菌素类药物



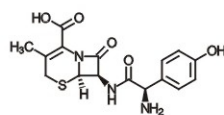
PEAK IDENTITIES:

1. Cefadroxil (头孢羟氨苄)
2. Ceftazidime (头孢他啶)
3. Cefaclor (头孢克洛)
4. Cephalexin (头孢氨苄)
5. Cephadrine (头孢拉定)
6. Cefotaxime (头孢噻肟)
7. Cefoxitin (头孢西丁)
8. Cefazolin (头孢唑啉)
9. Cephalothin (头孢菌素)

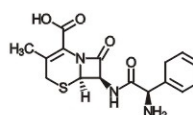
TEST CONDITIONS:

Columns: HALO ES-CN, 4.6 x 50 mm
Part Numbers 92814-404
Mobile Phase: A= 0.02 M Phosphate buffer, pH=2.7 (adj.)
B= Methanol
Gradient: 20% B to 40% B in 2.5 min.
Flow Rate: 2.0 mL/min.
Pressure: 225 bar at start of gradient
Temperature: 40° C
Detection: UV 254 nm, VWD
Injection Volume: 1.0 µL
Sample Solvent: 70/30 Water/Methanol
Response Time: 0.02 sec.
Flow Cell: 2.5 µL semi-micro
LC System: Shimadzu Prominence UFLC XR
ECV: about 14 µL

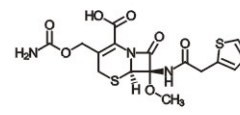
STRUCTURES:



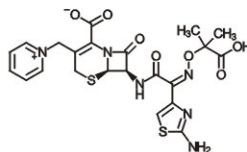
Cefadroxil



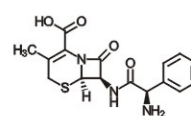
Cephalexin



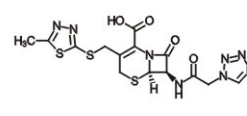
Cefoxitin



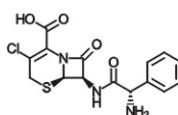
Ceftazidime



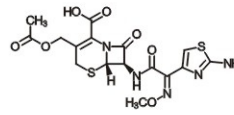
Cephadrine



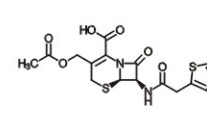
Cefazolin



Cefaclor



Cefotaxime

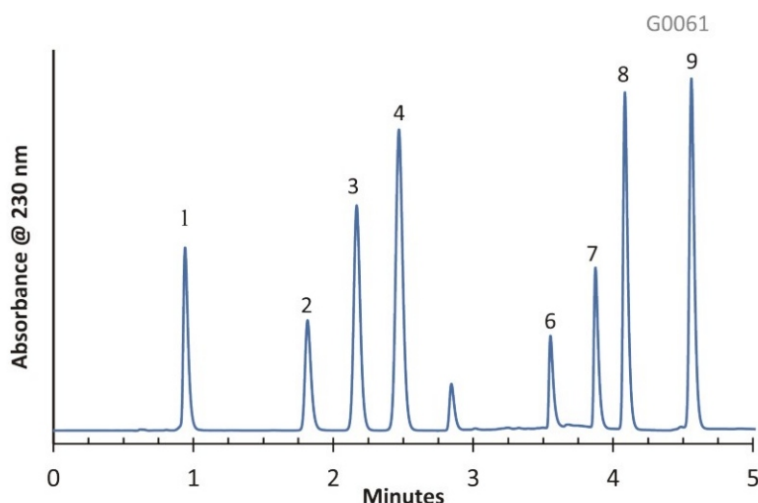


Cephalothin

These cephalosporins can be rapidly separated by reversed-phase HPLC on a HALO Fused-Core ES-CN bonded phase column.

Application Note: 078-DU

HPLC Separation of Diuretics on HALO Phenyl-Hexyl HALO 苯基色谱柱快速分离利尿剂类药物



PEAK IDENTITIES:

1. Amiloride (阿米洛利)
2. Caffeine (咖啡因)
3. Chlorothiazide (利噻嗪)
4. Hydrochlorothiazide (氢氯噻嗪)
5. Triamterene (氨苯蝶啶)
6. Torsemide (托拉塞米)
7. Furosemide (呋喃苯胺酸)
8. Indapamide (吲达帕胺)
9. Bumetanide (布美他尼)

TEST CONDITIONS:

Column: 4.6 x 100 mm, HALO Phenyl-Hexyl
Part Number: 92814-606
Mobile Phase:
A= 0.02 M Potassium phosphate buffer, (pH=3)
B= Acetonitrile

Time	%B	Time	%B
0	15	3.0	50
1.7	15	7.0	60

Flow Rate: 1.5 mL/min.

Pressure: 253 Bar (@start of gradient)

Temperature: 30°C

Detection: UV 230 nm, VWD

Injection Volume: 2 µL

Sample Solvent: Acetonitrile

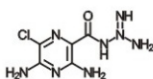
Response Time: 0.02 sec.

Flow Cell: 2.5 µL semi-micro

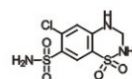
LC System: Shimadzu Prominence UFLC XR

ECV: ~14 µL

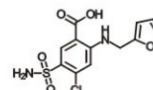
STRUCTURES:



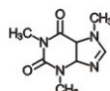
Amiloride



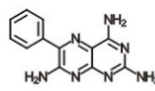
Hydrochlorothiazide



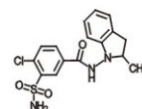
Furosemide



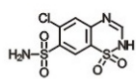
Caffeine



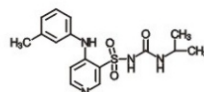
Triamterene



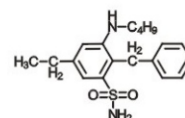
Indapamide



Chlorothiazide



Torsemide

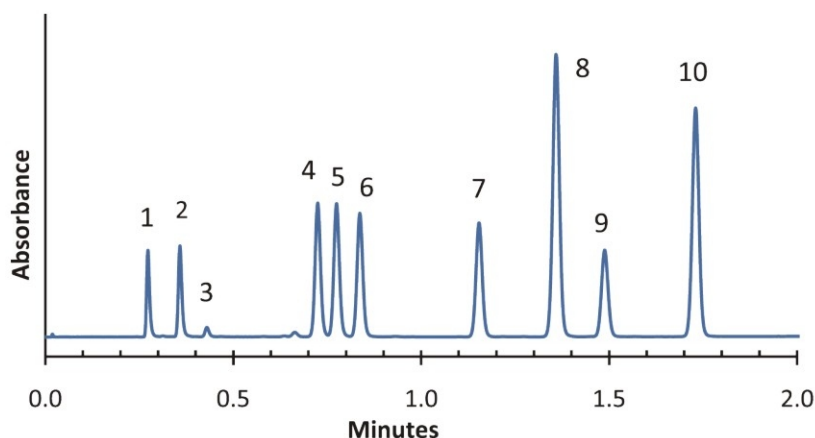


Bumetanide

This separation illustrates the utility of HALO Fused-Core Phenyl-Hexyl phase in the rapid analysis of common diuretics.

Application Note: 14-NS

Gradient Separation of NSAIDS on HALO C8 HALO C8 色谱柱快速梯度分离非甾体类药物



PEAK IDENTITIES:

1. Acetaminophen (对乙酰氨基酚)
2. Aspirin (阿司匹林)
3. Salicylic acid (水杨酸)
4. Tolmetin (甲苯酰吡啶乙酸)
5. Ketoprofen (酪洛芬)
6. Naproxen (萘普生)
7. Fenoprofen (非诺洛芬)
8. Diclofenac (双氯芬酸)
9. Ibuprofen (布洛芬)
10. Mefenamic acid (甲灭酸)

TEST CONDITIONS:

Column: 4.6 x 50 mm, HALO C8

Part Number: 92814-408

Mobile Phase: 38/62-- A/B (start)

A= 0.02 M sodium phosphate buffer, pH=2.5

B= methanol

Gradient:

0.0 min 62%B

0.1 min 62%B

2.0 min 85%B

Flow Rate: 2.0 mL/min.

Pressure: 286 Bar

Temperature: 35°C

Detection: UV 254 nm, VWD

Injection Volume: 1.0 µL

Sample Solvent: mobile phase

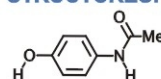
Response Time: 0.02 sec.

Flow Cell: 2.5 µL semi-micro

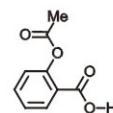
LC System: Shimadzu Prominence UFLC XR

Extra column volume: ~14 µL

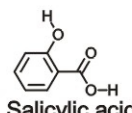
STRUCTURES:



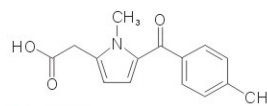
Acetaminophen



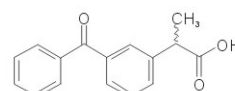
Aspirin



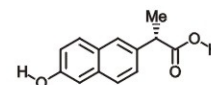
Salicylic acid



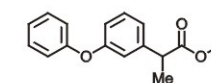
Tolmetin



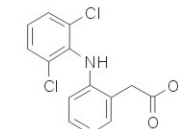
Ketoprofen



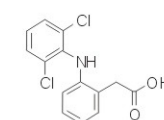
Naproxen



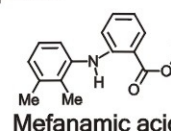
Fenoprofen



Diclofenac



Ibuprofen

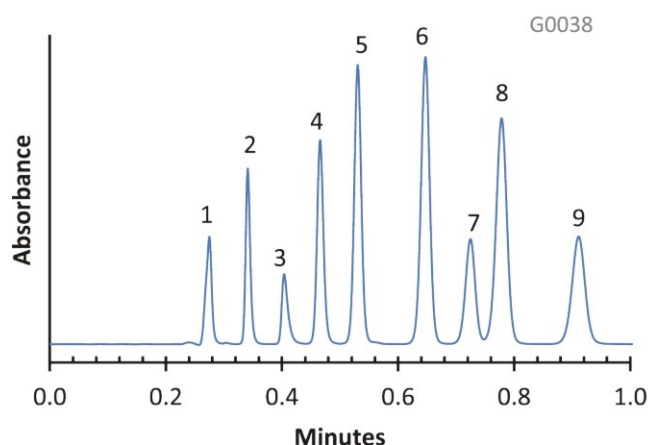


Mefenamic acid

Application Note: 56-NS

Isocratic Separation of NSAIDs on HALO ES-CN Phase

HALO ES-CN 色谱柱快速分离非甾体抗炎药



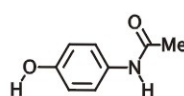
PEAK IDENTITIES:

1. Acetaminophen (对乙酰氨基酚)
2. Aspirin (阿司匹林)
3. Salicylic acid (水杨酸)
4. Tolmetin (甲苯酸吡啶乙酸)
5. Naproxen (萘普生)
6. Fenoprofen (非诺洛芬)
7. Ibuprofen (布洛芬)
8. Diclofenac (双氯芬酸)
9. Mefenamic acid (甲灭酸)

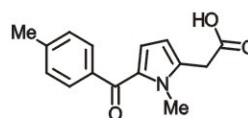
TEST CONDITIONS:

Column: 4.6 x 50 mm, HALO ES-CN
 Part Number: 92814-404
 Mobile Phase: 50/50-A/B
 A= 0.02 M potassium phosphate buffer, pH=2.5
 B=Acetonitrile
 Flow Rate: 2.0 mL/min.
 Pressure: 165 Bar
 Temperature: 35 °C
 Detection: UV 230 nm, VWD
 Injection Volume: 0.5 µL
 Sample Solvent: Water/methanol
 Response Time: 0.02 sec.
 Flow Cell: 2.5 µL semi-micro
 LC System: Shimadzu Prominence UFLC XR
 Extra column volume: ~14 µL

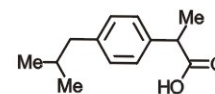
STRUCTURES:



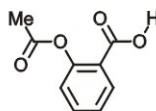
Acetaminophen



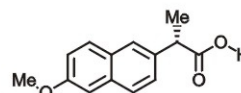
Tolmetin



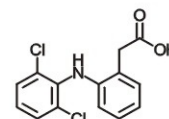
Ibuprofen



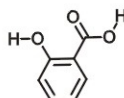
Aspirin



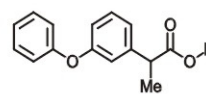
Naproxen



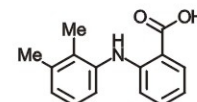
Diclofenac



Salicylic acid



Fenoprofen

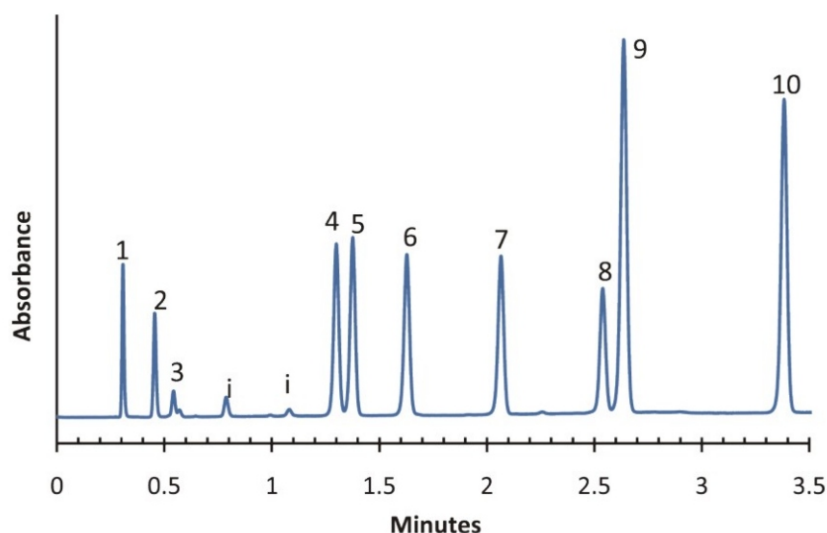


Mefenamic acid

This separation illustrates the separating power of HALO Fused-Core stationary phases. Nine NSAID drugs are separated in under one minute on a 50 mm HALO ES-CN column.

Application Note: 16-NS

Gradient Separation of NSAIDS on HALO RP-Amide HALO RP-Amide 色谱柱梯度分离非甾体抗炎药



PEAK IDENTITIES:

1. Acetaminophen (对乙酰氨基酚)
2. Aspirin (阿司匹林)
3. Salicylic acid (水杨酸)
- i=impurity
4. Tolmetin (甲苯吡啶乙酸)
5. Ketoprofen (萘洛芬)
6. Naproxen (萘普生)
7. Fenoprofen (非诺洛芬)
8. Ibuprofen (布洛芬)
9. Diclofenac (双酚氯酸)
10. Mefenamic acid (甲灭酸)

TEST CONDITIONS:

Column: 4.6 x 50 mm, HALO RP-Amide
Part Number: 92814-407
Mobile Phase: 50/50– A/B (start)
A= 0.02 M sodium phosphate buffer, pH=2.5
B= methanol

Gradient:

0.0 min 50%B
0.1 min 50%B
0.5 min 55%B
3.5 min 80%B
4.0 min 80%B

Flow Rate: 2.0 mL/min.

Pressure: 289 Bar

Temperature: 35°C

Detection: UV 254 nm, VWD

Injection Volume: 1.0 µL

Sample Solvent: mobile phase

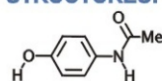
Response Time: 0.02 sec.

Flow Cell: 2.5 µL semi-micro

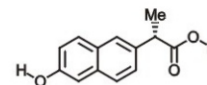
LC System: Shimadzu Prominence UFLC XR

Extra column volume: ~14 µL

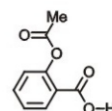
STRUCTURES:



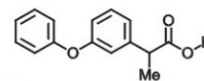
Acetaminophen



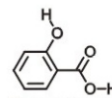
Naproxen



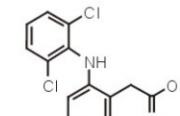
Aspirin



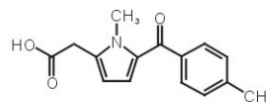
Fenoprofen



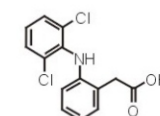
Salicylic acid



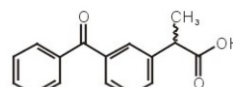
Diclofenac



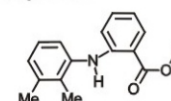
Tolmetin



Ibuprofen

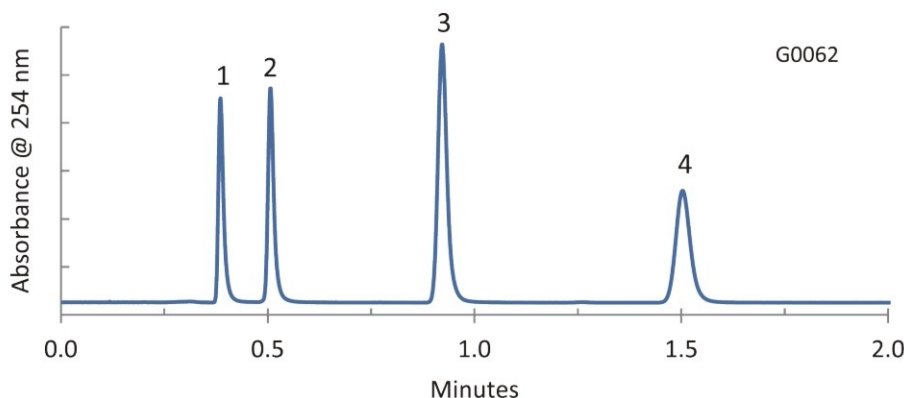
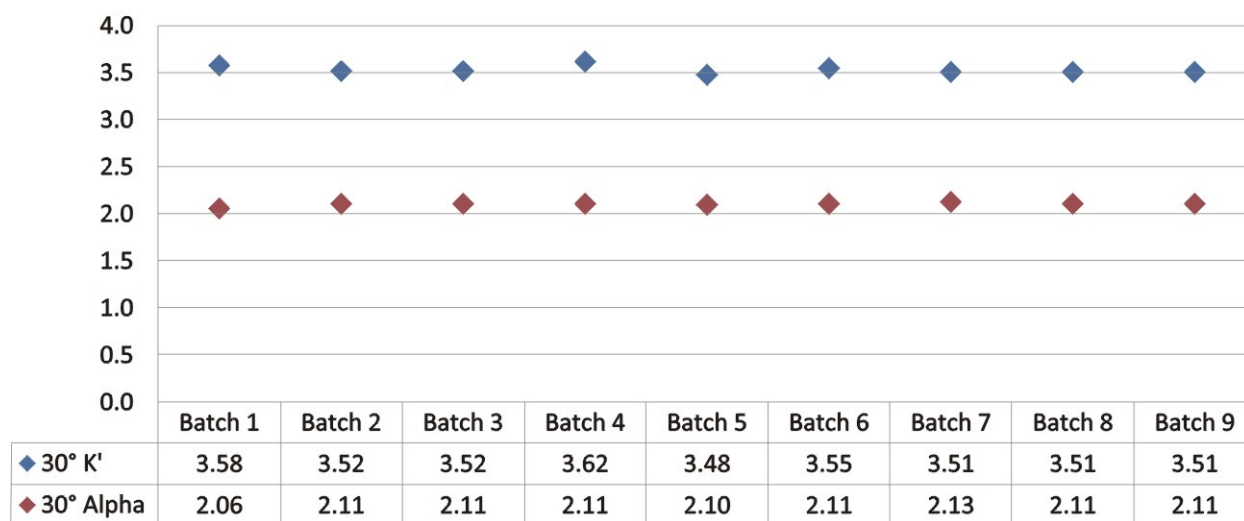


Ketoprofen



Mefenamic acid

HALO-5® C18 Lot to Lot Reproducibility HALO-5 C18 色谱柱批次重复性实验结果



PEAK IDENTITIES:

1. Uracil (尿嘧啶)
2. Phenol (苯酚)
3. 4-Cl-1-Nitrobenzene (4-氯硝基苯)
4. Naphthalene (萘)

TEST CONDITIONS:

Columns: 4.6 x 50 mm HALO-5 C18
Part Number: 95814-402
Mobile Phase: 57/43 acetonitrile/water
Flow Rate: 1.0 mL/min.
Pressure: 39 bar
Temperature: 30° C
Detection: UV 254 nm, VWD
Injection Volume: 1.0 µL
Sample Solvent: 50/50 ACN/water
Flow Cell: 5 µL semi-micro
LC System: Agilent 1100

The retention factor and selectivity calculated across several batches of HALO-5 C18 show superior reproducibility. Retention factor is calculated for naphthalene while selectivity is calculated between naphthalene and 4-chloro-1-nitrobenzene.

References

Fused-Core particle technology has been thoroughly studied by recognized experts in the field of chromatography. Below is a partial list of their publications that report on the characteristics, performance, and application of UHPLC columns packed with Fused-Core particles.

1. Mass-transfer kinetics in a shell packing material for chromatography. *Anal. Chem* (2007) 79, 5972-5979, Cavazzini, A., Gritti, F., Kaczmarek, K., Marchetti, N. & Guiochon, G.
2. Fused core particle technology as an alternative to sub 2 m particles to achieve high separation efficiency with low backpressure. *Journal of separation science* (2007) 30, 3104-3109, Cunliffe, J. & Maloney, T.
3. Comparison between the efficiencies of columns packed with fully and partially porous C18-bonded silica materials. *Journal of Chromatography A* (2007) 1157, 289-303, Gritti, F., Cavazzini, A., Marchetti, N. & Guiochon, G.
4. Unusual behavior of the height equivalent to a theoretical plate of a new poroshell stationary phase at high temperatures. *Journal of Chromatography A* (2007) 1169, 125-138, Gritti, F. & Guiochon, G.
5. Comparative study of the performance of columns packed with several new fine silica particles: Would the external roughness of the particles affect column properties? *Journal of Chromatography A* (2007) 1166, 30-46, Gritti, F. & Guiochon, G.
6. Comparison between the loading capacities of columns packed with partially and totally porous fine particles: What is the effective surface area available for adsorption? *Journal of Chromatography A* (2007) 1176, 107-122, Gritti, F. & Guiochon, G.
7. Fused-core silica column high-performance liquid chromatography/tandem mass spectrometric determination of rimonabant in mouse plasma. *Anal. Chem* (2007) 79, 5668-5673, Hsieh, Y., Duncan, C. & Brisson, J.
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