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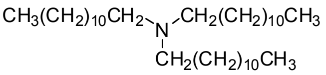
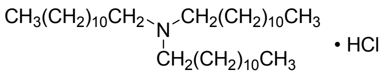
Hydrogen



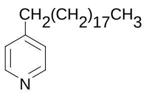
Hydrogen ionophore I
(Tridecylamine)
$C_{36}H_{75}N$ M_r 522.00 [102-87-4]

95292 **Selectophore®, function tested** 100 mg, 500 mg



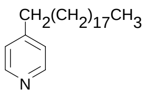
Tridodecylamine hydrochloride
(Trilaurylammonium chloride)
$C_{36}H_{75}N \cdot HCl$ M_r 558.45 [2486-89-7]

43538 **Selectophore®** 500 mg



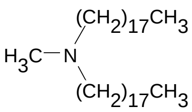
Hydrogen ionophore II
(ETH 1907;4-Nonadecylpyridine)
$C_{24}H_{43}N$ M_r 345.60 [70268-36-9]

95295 **Selectophore®, function tested** 50 mg



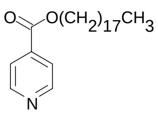
Hydrogen ionophore II
(ETH 1907;4-Nonadecylpyridine)
$C_{24}H_{43}N$ M_r 345.60 [70268-36-9]

95295 **Selectophore®, function tested** 50 mg



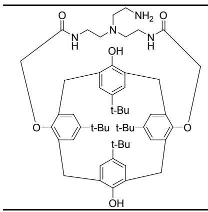
Hydrogen ionophore III
(N,N-Dioctadecylmethylamine)
$C_{37}H_{77}N$ M_r 536.02 [4088-22-6]

95298 **Selectophore®, function tested** 50 mg



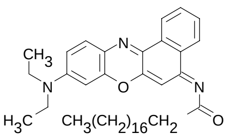
Hydrogen ionophore IV
(ETH 1778;Octadecyl isonicotinate)
$C_{24}H_{41}NO_2$ M_r 375.59 [103225-02-1]

95296 **Selectophore®, function tested** 50 mg



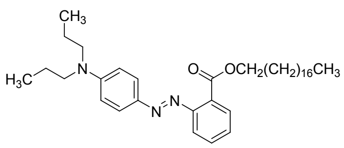
Hydrogen ionophore V
(Calix[4]-aza-crown)
$C_{54}H_{7}4N_4O_6$ M_r 875.18

16979 **Selectophore®, function tested** 50 mg



Chromoionophore I
(ETH 5294; 3-Octadecanoylimino-7-(diethylamino)-1,2-benzophenoxazine; 9-(Diethylamino)-5-(octadecanoylimino)-5*H*-benzo[a]phenoxazine; N-Octadecanoyl-Nile blue)
$C_{38}H_{53}N_3O_2$ M_r 583.86 [125829-24-5]

27086 **Selectophore®** 10 mg, 100 mg



Octadecyl 2-(4-dipropylaminophenylazo)benzoate
(ETH 2418; Propyl red octadecyl ester)
$C_{37}H_{59}N_3O_2$ M_r 577.88 [204581-67-9]

17384 **Selectophore®** 50 mg, 250 mg

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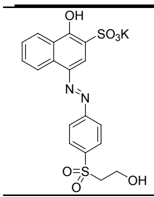

Chromoionophore XVII
(GJM-541, 1-Hydroxy-4-[4-(2-hydroxyethylsulfonyl)phenylazo]naphthalene-2-sulfonic acid potassium salt)
$C_{18}H_{15}KN_2O_7S_2$ M_r 474.55 [156122-91-7]

19684 **Selectophore®** 100 mg

Hydrogen ionophore I - Cocktail A
H^+-selective membrane solution for microelectrodes
95291 **Selectophore®** package with 0.1 mL

Hydrogen ionophore I - Cocktail B
H^+-selective membrane solution for microelectrodes
95293 **Selectophore®** package with 0.1 mL

Hydrogen ionophore II - Cocktail A
H^+-selective membrane solution for microelectrodes
95297 **Selectophore®** package with 0.1 mL

Ion-Selective Electrodes

Microelectrodes

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Electrochemical Transduction

Ion-Selective Electrodes

Application 1 and Sensor Type [1,2,3]

Assay of H^+ activity in whole blood, plasma, serum, and aqueous solutions with solvent polymeric membrane electrodes based on Hydrogen ionophore I.

Recommended Membrane Composition

1.00	wt%	Hydrogen ionophore I (95292)
65.50	wt%	Bis(1-butylpentyl)decan-1,10-diyl diglutarate (30585)*
0.50	wt%	Potassium tetrakis(4-chlorophenyl)borate (60591)
33.00	wt%	Poly(vinyl chloride) high molecular weight (81392)

* The use of bis(l-butylpentyl)adipate (02150) or bis(2-ethylhexyl)sebacate (84818) leads to membrane electrodes of similar performance

Recommended Cell Assembly

Reference ││ sample solution ││ ion-selective membrane │ buffer pH 5.6 │ AgCl, Ag

Electrode Characteristics and Function

Selectivity coefficients $\log K^{Pot}_{H,M}$ as obtained by the fixed interference method on pH buffered solutions.

	required[1)]	found
$\log K^{Pot}_{H,Na}$	<-8.5	-10.4
$\log K^{Pot}_{H,K}$	<-7.0	-9.8
$\log K^{Pot}_{H,Ca}$	<-7.7	<-11.1

Slope of linear regression: 57.8 ± 0.1 mV at 20°C			
Practical pH measuring range: 4.5-11.0			
Stability: Standard deviation:		<0.35 mV	0.05 mV
Response time: 90% response 0.4 s			
Lifetime:	$\log P_{TLC}$[2)] ionophore	> 8.4	11.6
	plasticizer	>12.8	10.8

1) for measurements in whole blood (1% interference, worst case)[4,5]
2) lipophilicity, determined by thin layer chromatography [6]

[1] D. Ammann, P. Anker, E. Metzger, U. Oesch, W. Simon, in: Ion Measurements in Physiology and Medicine, Eds. M. Kessler, D.K. Harrison, J. Höper, Springer-Verlag, Berlin, Heidelberg 102 (1985).
[2] P. Schulthess, Y. Shijo, H.V. Pham, E. Pretsch, D. Ammann, W. Simon, A hydrogen ion-selective liquid-membrane electrode based on tri-*n*-dodecylamine as neutral carrier. **Anal. Chim. Acta *131***, 111 (1981).
[3] P. Anker, D. Ammann, W. Simon, Blood pH Measurement with a Solvent Polymeric Membrane Electrode in Comparison with a Glass Electrode. **Mikrochim. Acta I**, 237 (1983).
[4] A. Lewenstam, Ion selective electrodes in clinical chemistry. **Anal. Proc. *28***, 106 (1991).
[5] U. Oesch, P. Anker, D. Ammann, W. Simon, in: Ion-Selective Electrodes, Eds. E. Pungor, I. Buzás, Akadémiai Kiadó, Budapest 81 (1985).
[6] O. Dinten, U.E. Spichiger, N. Chaniotakis, P. Gehrig, B. Rusterholz, W.E. Morf, W. Simon, Lifetime of neutral-carrier-based liquid membranes in aqueous samples and blood and the lipophilicity of membrane components, **Anal. Chem. *63***, 596 (1991).

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Application 2 and Sensor Type [7]

Assay of H^+ activity with solvent polymeric membrane electrodes based on Hydrogen ionophore I.

Recommended Membrane Composition

10.00	wt%	Hydrogen ionophore I (95292)
0.70	wt%	Sodium tetraphenylborate (72018)
64.30	wt%	Dibutyl sebacate (84838)
25.00	wt%	Poly(vinyl chloride) high molecular weight (81392)

Recommended Cell Assembly

Reference ǀǀ sample solution ǀǀ ion-selective membrane ǀ 0.25 M KH_2PO_4 + 0.25 M Na_2HPO_4 + 0.1 M NaCl ǀ Ag, AgCl

Electrode Characteristics and Function

Selectivity coefficients as obtained by the fixed interference method on pH-buffered solutions.

	<-11.3	-10.5
	-11.2	

Slope of linear regression: 58.3 mV
Practical pH measuring range: 5.5-10.8
Electrical resistance: $2.4 \cdot 10^6$ Ω
Lifetime: log P_{TLC} ionophore 11.6

Application 3 and Sensor Type [8]

Assay of H^+ activity with solvent polymeric membrane electrode based on Hydrogen ionophore II. Applications evaluated for aqueous solutions only.

Recommended Membrane Composition

1.0	wt%	Hydrogen ionophore II (95295)
1.0	wt%	Potassium tetrakis(4-chlorophenyl)borate (60591)
68.0	wt	2-Nitrophenyl octyl ether (73732)
30.0	wt%	Poly(vinyl chloride) high molecular weight (81392)

Recommended Cell Assembly

Reference ǀ ǀsample solution ǀ ǀliquid membraneǀbuffer pH 5.6ǀAgCl,Ag

Electrode Characteristics and Function

Selectivity coefficients as obtained by the fixed interference method on pH-buffered solutions.

	-9.7	-7.5
	-8.8	

Slope of linear regression: 58.1 ± 0.4 mV (pH 1.3-9.0)
Practical pH measuring range (pH-buffered solutions, ion background of 140 mM Na^+): 1.3-9.8

[7] S.C. Ma, N.A. Chaniotakis, M.E. Meyerhoff, Response properties of ion-selective polymeric membrane electrodes prepared with aminated and carboxylated poly(vinyl chloride). **Anal. Chem. *60***, 2293 (1988).
[8] E. Bakker, A. Xu, E. Pretsch, Optimum composition of neutral carrier based pH electrodes. **Anal. Chim. Acta, *295***, 253 (1994).

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Application 4 and Sensor Type [9]

Assay of H^+ activity with solvent polymeric membrane electrodes based on Hydrogen ionophore III for biological studies.

Recommended Membrane Composition

1.00	wt%	Hydrogen ionophore III (95298)
0.30	wt%	Sodium tetraphenylborate (72018)
67.00	wt%	Bis(2-ethylhexyl)sebacate (84818)
31.70	wt%	Poly(vinyl chloride) high molecular weight (81392)

Recommended Cell Assembly

Reference | | sample solution | | ion-selective electrode | buffer pH 5.6 | AgCl,Ag

Electrode Characteristics and Function

Selectivity Coefficients as obtained by the fixed interference method on pH-buffered solutions.

	-10.3	<-10.6
$\log K^{Pot}_{H,K}$	-10.0	

Slope of linear regression: 58.4 ± 0.3 mV at 20°C (pH 3.0-11.0); no super-Nernstian response in the pH range 3.5-4.5
Stability: Standard deviation 0.09 mV (20°C, pH 7.86, static measurement)
Electrode lifetime: ~ 4 months
Electrode resistance: 1.49 ± 0.14 MΩ (n=6), (membrane area 50 mm^2; membrane thickness 0.4 mm)
Response time: ~ 0.5 s

Application 5 and Sensor Type [general 10, application 11]

Assay of H^+ activity (e.g. in the upper gastrointestinal tract) with solvent polymeric membrane electrodes based on Hydrogen ionophore IV.

Recommended Membrane Composition

1.0	wt%	Hydrogen ionophore IV (95296)
1.0	wt%	Potassium tetrakis(4-chlorophenyl)borate (60591)
68.0	wt%	2-Nitrophenyl octyl ether (73732)
30.0	wt%	Poly(vinyl chloride) high molecular weight (81392)

Recommended Cell Assembly

Reference | | sample solution | | ion-selective electrode | buffer pH 5.6 | AgCl,Ag

Electrode Characteristics and Function

Selectivity Coefficients $\log K^{Pot}_{H,M}$ as obtained by the separate solution method (0.1 M of the chloride salts).

$\log K^{Pot}_{H,Li}$	-6.9
$\log K^{Pot}_{H,Na}$	-5.6
$\log K^{Pot}_{H,K}$	-4.4

Lifetime: log P_{TLC}[1)] ionophore: 14.6

Slope of linear regression: Nernstian electrode response (pH 0-8.0)
Practical pH measuring range (pH-buffered solutions, ion background of 60 mM Li+, 11.4 mM boric acid, 6.6 mM citric acid/HCl): 0-4 [11]
Lifetime: log P_{TLC}[1)] ionophore 15.2

[1)] lipophility, determined by thin layer chromatography[6]

[9] H.-L. Wu, R.-Q. Yu, A PVC membrane pH-sensitive electrode based on methyldioctadecylamine as neutral carrier. **Talanta *34***, 577 (1987).
[10] U. Oesch, Z. Brzózka, A. Xu, B. Rusterholz, G. Suter, H.V. Pham, D.H. Welti, D. Ammann, E. Pretsch, W. Simon, Design of neutral hydrogen ion carriers for solvent polymeric membrane electrodes of selected pH range. **Anal. Chem. *58***, 2285 (1986).
[11] U. Oesch, Z. Brzózka, A. Xu, W. Simon, Solvent polymeric membrane pH catheter electrode for intraluminal measurements in the upper gastrointestinal tract. **Med. Biol. Eng. Comp. *25***, 414 (1987).

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Application 6 and Sensor Type [12]

Assay of H^+ activity with solvent polymeric membrane electrodes based on Chromoionophore I.

Recommended Membrane Composition

1.00	wt%	Chromoionophore I (27086)
0.60	wt%	Potassium tetrakis(4-chlorophenyl)borate (60591)
66.00	wt%	2-Nitrophenyl octyl ether (73732)
32.40	wt%	Poly(vinyl chloride) high molecular weight (81392)

Recommended Cell Assembly

Reference | | sample solution | | ion-selective electrode | buffer solution at various pH | AgCl,Ag

Electrode Characteristics and Function

Selectivity Coefficients $\log K^{Pot}_{H,M}$ as obtained by the fixed interference method on pH-buffered solutions.

$\log K^{Pot}_{H,Li}$	-10.8	$\log K^{Pot}_{H,K}$	-10.5
$\log K^{Pot}_{H,Na}$	-10.9		-11.2

Slope of linear regression: 58.2 ± 0.3 mV/dec (pH 4-12)
Practical pH measuring range (pH-buffered solutions, ion background of 60 mM Li^+, 0.6 mM citric acid, 11.4 mM boric acid, 60 mM LiOH): 4-12; in Britton-Robinson buffer: pH 2.5
Stability: Standard deviation <0.1 mV/h at pH 6.06 in stirred solutions
Response time: response time for one pH unit change in the range of pH 6-7: <10 s

Application 7 and Sensor Type [13]

Liquid membrane pH sensor based on Hydrogen ionophore V exhibited high selectivity over alkali metal ions.

Recommended Membrane Composition

0.88	wt%	Hydrogen ionophore V (16979)
0.23	wt%	Sodium tetrakis(4-fluorophenyl)borate dihydrate (72014)
65.93	wt%	2-Nitrophenyl octyl ether (73732)
32.96	wt%	Poly(vinyl chloride) high molecular weight (81392)

Recommended Cell Assembly

Reference | | sample solution | | ion-selective electrode | potassium phosphate buffer pH 6.9 | AgCl,Ag

Electrode Characteristics and Function

Selectivity Coefficients $\log K^{Pot}_{H,M}$ as obtained by the fixed interference method on pH-buffered solutions.

$\log K^{Pot}_{H,Li}$	<-11.2	$\log K^{Pot}_{H,K}$	<-11.0
$\log K^{Pot}_{H,Na}$	<-11.0		

Slope of linear regression: 54 mV/dec (pH 2.5-11.5)
Dynamic pH measuring range: 2.5-11.5
Response time: <10 s

[12] V.V. Cosofret, T.M. Nahir, E. Lindner, R.P. Buck, New neutral carrier-based H^+-selective membrane electrodes. **J. Electroanal. Chem. *327***, 137 (1992).
[13] X.J. Liu, B. Peng, F. Liu, Y. Qin, Potentiometric liquid membrane pH sensors based on calix[4]-aza-crowns. **Sens. and Act. B *125***, 656 (2007).

Microelectrodes

Application 1 and Sensor Type *general*[14,15] *application*[16,17,18]
Assay of H^+ activity in extra- and intracellular (single-cell) liquids with H^+ microelectrodes based on Hydrogen ionophore I. This cocktail must be equilibrated in a 100% carbon dioxide atmosphere for ~16 hours (overnight).

Hydrogen ionophore I - Cocktail A (21048)

Cocktail Composition:

10.00	wt%	Hydrogen ionophore I (95292)
89.30	wt%	2-Nitrophenyl octyl ether (73732)
0.70	wt%	Sodium tetraphenylborate (72018)

equilibration with carbon dioxide[15]

Recommended Cell Assembly
Reference ǀǀ sample solution ǀǀ cocktail ǀ buffer solution, pH 7 ǀ AgCl,Ag

Electrode Characteristics and Function

Selectivity Coefficients $\log K^{Pot}_{H,M}$ as obtained by the fixed interference method in pH-buffered solutions.

$\log K^{Pot}_{H,Na}$	-10.4	$\log K^{Pot}_{H,K}$	- 9.8
$\log K^{Pot}_{H,Li}$	-10.8	$\log K^{Pot}_{H,Ca}$	< -11.1

Slope of linear regression: 58.0 ± 0.4 mV (pH 5.5-12.0)
Practical pH measuring range (pH-buffered solutions, ion background of 69 mM Na^+, 11.4 mM borate, 10 mM phosphate, 6.7 mM citrate): 5.5-12.0
Electrical resistance, tip diameter ~1 µm: ~10^{11} Ω
Response time 90% response time: ≤ 5 s

[14] P. Schulthess, Y. Shijo, H.V. Pham, E. Pretsch, D. Ammann, W. Simon, A hydrogen ion-selective liquid-membrane electrode based on tri-*n*-dodecylamine as neutral carrier. **Anal. Chim. Acta *131***, 111 (1981).
[15] D. Ammann, F. Lanter, R.A. Steiner, P. Schulthess, Y. Shijo, W. Simon, Neutral carrier based hydrogen ion selective microelectrode for extra- and intracellular studies. **Anal. Chem. *53***, 2267 (1981).
[16] R.P. Kraig, C.R. Ferreira-Filho, C. Nicholson, Alkaline and acid transients in cerebellar microenvironment. **J. Neurophysiol. *49***, 831 (1983).
[17] X. Rao, Y. Ma, A Novel Combinational pH-$P_{(CO_2)}$ Microelectrode. **Anal. Biochem. *212***, 43 (1993).
[18] D. Ammann, P. Caroni, Preparation and use of micro- and macroelectrodes for measurement of transmembrane potentials and ion activities. **Methods in Enzymol. *172***, 136 (1989).

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Application 2 and Sensor Type *general 14,15, applications 16,18,19,20,21,22,23,24,25,26,27,28,29,30*

Assay of H^+ activity in extra- and intracellular (single cell) liquids with H^+ microelectrodes based on Hydrogen ionophore I. This cocktail must not be equilibrated with carbon dioxide.

Hydrogen ionophore I - Cocktail B (95293)

Cocktail Composition

10.00	wt%	Hydrogen ionophore I (95292)
89.30	wt%	2-Nitrophenyl octyl ether (o-NPOE) (73732)
0.70	wt%	Potassium tetrakis(4-chlorophenyl)borate (60591)

Recommended Cell Assembly

Reference ││ sample solution ││ cocktail │ buffer solution, pH 7 │ AgCl, Ag

Electrode Characteristics and Function

Selectivity Coefficients $\log K^{Pot}_{H,M}$ as obtained by the fixed interference method in pH-buffered solutions.

$\log K^{Pot}_{H,Na}$	-10.4	$\log K^{Pot}_{H,K}$	- 9.8
$\log K^{Pot}_{H,Li}$	-10.8	$\log K^{Pot}_{H,Ca}$	< -11.1

Slope of linear regression: 58.0 ± 0.4 mV (pH 5.5-12.0)
Practical pH measuring range (pH-buffered solutions, ion background of 69 mM Na^+, 11.4 mM borate, 10 mM phosphate, 6.7 mM citrate): 5.5-12.0
Electrical resistance, tip diameter ~1 µm: $\sim 10^{11}\ \Omega$
Response time   90% response time: ≤ 5 s

[19] W.A.C. Mutch, A.J. Hansen, Extracellular pH changes during spreading depression and cerebral ischemia: mechanisms of brain pH regulation. **J. Cerebr. Blood Flow Metabol.** ***4***, 17 (1984).
[20] D. Ellis, K.T. MacLeod, Sodium-dependent control of intracellular pH in Purkinje fibres of sheep heart. **J. Physiol.** ***359***, 81 (1985).
[21] W.R. Schlue, R.C. Thomas, A dual mechanism for intracellular pH regulation by leech neurones. **J. Physiol.** ***364***, 327 (1985).
[22] C.C. Aickin, Direct measurement of intracellular pH and buffering power in smooth muscle cells of guinea-pig vas deferens. **J. Physiol.** ***349***, 571 (1984).
[23] H. Moser, Intracellular pH regulation in the sensory neurone of the stretch receptor of the crayfish (Astacus fluviatilis). **J. Physiol.** ***362***, 23 (1985).
[24] K. Bomsztyk, M.B. Calalb, A new microelectrode method for simultaneous measurement of pH and PCO2. **Am. J. Physiol.** ***251***, F933 (1986).
[25] H. Oberleithner, F. Lang, G. Messner, W. Wang, Mechanism of hydrogen ion transport in the diluting segment of frog kidney. **Pflügers Arch.** ***402***, 272 (1984).
[26] K. Yoshitomi, E. Frömter, Cell pH of rat renal proximal tubule in vivo and the conductive nature of peritubular HCO3- (OH-) exit. **Pflügers Arch.** ***402***, 300 (1984).
[27] G. Messner, A. Koller, F. Lang, The effect of phenylalanine on intracellular pH and sodium activity in proximal convoluted tubule cells of the frog kidney. **Pflügers Arch.** ***404***, 145 (1985).
[28] B.J. Harvey, J. Ehrenfeld, Regulation of intracellular sodium and pH by the electrogenic H+ pump in frog skin. **Pflügers Arch.** ***406***, 362 (1986).
[29] R.C. Thomas, Eccentric double micropipette suitable for both pHI micro-electrodes and for intracellular iontophoresis. J. Physiol. 371, 24P (1986).
[30] Y. Saito, T. Ozawa, A. Nishiyama, Effects of intra- and extracellular H^+ and Na^+ concentrations on $Na(^+)$-H^+ antiport activity in the lacrimal gland acinar cells. **Pflügers Arch.** ***417***, 382 (1990).

Application 3 and Sensor Type *general 31, applications 29,30,32*

Assay of H^+ activity in extra- and intracellular (single cell) liquids with H^+-microelectrodes based on Hydrogen ionophore II. This cocktail must not be equilibrated with carbon dioxide.

Hydrogen ionophore II - Cocktail A

Cocktail Composition

6.00	wt%	Hydrogen ionophore II (95295)
93.00	wt%	2-Nitrophenyl octyl ether (o-NPOE) (73732)
1.00	wt%	Potassium tetrakis(4-chlorophenyl)borate (60591)

Recommended Cell Assembly

Reference ¦¦ sample solution ¦¦ cocktail ¦ buffer solution, pH 7 ¦ AgCl,Ag

Electrode Characteristics and Function

Selectivity Coefficients $\log K^{Pot}_{H,M}$ as obtained by the fixed interference method in pH-buffered solutions.[33]

$\log K^{Pot}_{H,Na}$	-9.6
$\log K^{Pot}_{H,Li}$	-8.8

Slope of linear regression: 57.1 ± 0.8 mV (pH 2.0-9.0)
Practical pH measuring range (pH-buffered solutions, ion background of 10 mM Na^+, 200 mM K^+, 2 mM Mg2+, 0.01 mM Ca^{2+}, 6.7 mM citric acid, 10 mM TRIS/HCl): 2.0-9.0
Electrical resistance, tip diameter ~1 µm: ~$4 \cdot 10^{10}$ Ω
Response time 90% response time: 0.6 s

[31] P. Chao, D. Ammann, U. Oesch, W. Simon, F. Lang, Extra- and intracellular hydrogen ion-selective microelectrode based on neutral carriers with extended pH response range in acid media. **Pflügers Arch. *411***, 216 (1988).
[32] M. Thaler, W. Simonis, G. Schönknecht, Light-Dependent Changes of the Cytoplasmic H+ and Cl− Activity in the Green Alga Eremosphaera viridis. **Plant. Physiol. *99***, 103 (1992).
[33] T. Bührer, P. Gehrig, W. Simon, Neutral-Carrier-Based Ion-Selective Microelectrodes. Design and Application. **Anal. Sci. *4***, 547 (1988).

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Application 4 and Sensor Type *genera l34,35 applications 36 ,37*

Assay of H^+ activity in extra- and intracellular (single cell) liquids with H^+-microelectrodes and H^+-minielectrodes based on Octadecyl 2-(4-dipropylaminophenylazo)benzoate.

Recommended Membrane Composition

10.0	wt%	Octadecyl 2-(4-dipropylaminophenylazo)benzoate (ETH^T 2418) (17384)
33.5	wt%	2-Nitrophenyl octyl ether (o-NPOE) (73732)
1.0	wt%	Potassium tetrakis(4-chlorophenyl)borate (60591)
15.9	wt%	Poly(vinyl chloride) high molecular weight (81392)
17.1	wt%	Chloroparaffin (25720)
22.5	wt%	Mesamoll® (50987)

Recommended Cell Assembly

Reference | | sample solution | | ion-selective electrode | buffer pH 5.6 (1M citric acid, 2.73M NaOH, 0.01M NaCl) | AgCl,Ag

Electrode Characteristics and Function

Selectivity Coefficients $\log K_{H,M}^{Pot}$ as obtained by the fixed interference method in pH-buffered solutions[37].

$\log K_{H,Na}^{Pot}$	-8.6
$\log K_{H,K}^{Pot}$	-9.7
$\log K_{H,Ca}^{Pot}$	<-7.8

Slope of linear regression: 57.5 ± 0.5 mV (pH <1-9)
Electrical resistance, tip diameter ~1 µm: ~35 ± 8 (n=7) GΩ
Response time: <3 s
pK_a: 4.2

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Optical Transduction

Application 1 and Sensor Type[38,39]
Octadecyl 2-(4-dipropylaminophenylazo)benzoate (ETH^{T} 2418) can be used as a chromoionophore for optical pH measurement.

Electrode Characteristics and Function
pK_a: 4.2
Sensitive range: pH 2.5-11.5
Shift in maxima: 535 nm (base form)
435 nm (acid form)

Application 2 and Sensor Type[40]
The pH indicator Chromoionophore XVII can be covalently linked to –OH containing polymers (e.g. cellulose, hydrogels, Sephadex®). The changes in absorbance can be monitored with a conventional photometer but also by a reflectometer such as the Zeds MCS 521 VIS using a fibre optic Y-probe coupled to the flow module.

Electrode Characteristics and Function
pK_a: 7.55
Response time: <5 min
Sensitive range: pH 6-9
Shift in maxima: 541 nm (base form)
473 nm (acid form)

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