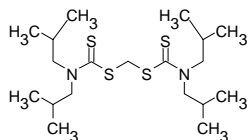


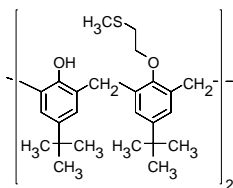
Silver



Silver ionophore III

(Lead ionophore II, S,S'-Methylenebis(N,N-iisobutyldithiocarbamate)
 $C_{19}H_{38}N_2S_4$ $M_r = 422.77$ [90276-58-7]

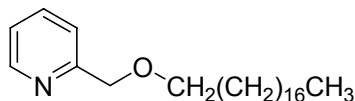
[15336](#) Selectophore[®], function tested 50 mg



Silver ionophore IV

(O,O''-Bis[2-(methylthio)ethyl]-*tert*-butylcalix[4]arene)
 $C_{50}H_{66}O_4S_2$ $M_r = 797.21$ [145237-25-8]

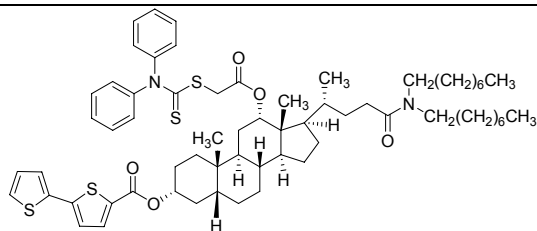
[15094](#) Selectophore[®], function tested 50 mg



Silver ionophore VI

(2-(Octadecyloxymethyl)pyridine)
 $C_{24}H_{43}NO$ $M_r = 361.60$

[19115](#) Selectophore[®], function tested 50 mg



Silver ionophore VII

((3 α ,5 β ,12 α)- 3-(((2,2'-Bithiophen)-5-ylcarbonyl]oxy)-12-{{2-[[diphenylamino]thioxomethyl]thio}acetyl]oxy)-N,N-dioctyl-cholan-24-amide)
 $C_{64}H_{88}N_2O_5S_4$ $M_r = 1093.65$ [1131580-96-5]

[44042](#) Selectophore[®], function tested 25 mg

Electrochemical Transduction

- Ion-Selective Electrodes

Optical Transduction

Electrochemical Transduction

Ion-Selective Electrodes

Application 1 and Sensor Type ¹

Assay of Ag⁺ with solvent polymeric membrane electrodes based on Silver ionophore III.

Recommended Membrane Composition

1.00	wt%	Silver ionophore V (15094)
0.47	wt%	Potassium tetrakis(<i>p</i> -chlorophenyl)borate (KTpCIPB) (60591)
65.53	wt%	Bis(1-butylpentyl) adipate (02150)
33.00	wt%	Poly(vinyl chloride) high molecular weight (81392)

Recommended Cell Assembly

Ag;AgCl;0.1M KCl | 0.1 M KNO₃ || sample solution || liquid membrane | 0.005 M AgNO₃, 0.01 M HNO₃ (pH 2)

Electrode Characteristics and Function

Selectivity Coefficients $\log K_{Ag, M}^{Pot}$ as obtained by the fixed interference method (0.1 M solutions of nitrates, pH 4).

$\log K_{Ag, Hg}^{Pot}$	-2.5	$\log K_{Ag, Li}^{Pot}$	<-5
$\log K_{Ag, K}^{Pot}$	<-4	$\log K_{Ag, Cd}^{Pot}$	<-5
$\log K_{Ag, Na}^{Pot}$	-5	$\log K_{Ag, NH_4}^{Pot}$	<-5
$\log K_{Ag, Cu}^{Pot}$	<-5	$\log K_{Ag, Mg}^{Pot}$	<-5
$\log K_{Ag, Ni}^{Pot}$	-5	$\log K_{Ag, Ca}^{Pot}$	<-5
$\log K_{Ag, Pb}^{Pot}$	<-4	$\log K_{Ag, Ba}^{Pot}$	<-5

Slope of linear regression: 56.7 mV/dec (10⁻⁵ to 10⁻¹ M AgNO₃)

Detection limit $4 \cdot 10^{-6}$ M Ag⁺

pH range: pH >2.5

Response time: 95% response time: < 10s

Drift: -0.36 mV/day (measured in 0.01 M AgNO₃ solution)

Application 2 and Sensor Type ²

Assay of Ag⁺ activity with solvent membrane electrodes based on Silver ionophore VI.

Recommended Membrane Composition

3.0	wt%	Silver ionophore VI (19115)
0.8	wt%	Potassium tetrakis(4-chlorophenyl)borate (K-TCPB) (60591)
67.4	wt%	Bis(1-butylpentyl)adipate (BBPA) (02150)
28.8	wt%	Poly(vinyl chloride) high molecular weight (81392)

Recommended Cell Assembly

AgCl, Ag, KCl (satd) | 0.3 M NH₄NO₃ || sample solution || liquid membrane | 1·10⁻³ M AgNO₃ | AgCl, Ag

¹ E. Malinowska, Z. Brzozka, K. Kasiura, R.J.M. Egberink, D.N. Reinhoudt, Silver selective electrodes based on thioether functionalized calix[4]arenes as ionophores. *Anal. Chim. Acta* **298**, 245 (1994).

² unpublished

Electrode Characteristics and Function

Selectivity Coefficients $\log K_{Ag, M}^{Pot}$ as obtained by the separate solution method (0.01 M solutions of nitrates).

$\log K_{Ag, Hg}^{Pot}$	-0.3	$\log K_{Ag, Na}^{Pot}$	-2.0
$\log K_{Ag, Mg}^{Pot}$	-8.2	$\log K_{Ag, Pb}^{Pot}$	-2.6
$\log K_{Ag, Zn}^{Pot}$	-3.2	$\log K_{Ag, Ni}^{Pot}$	-0.5

Slope of linear regression: 53.0 mV/dec ($9 \cdot 10^{-6}$ to $4 \cdot 10^{-2}$ M $AgNO_3$)
 Detection limit: $8 \cdot 10^{-6}$ M Ag^+

Application 3 and Sensor Type ³

Nano-level monitoring of Ag^+ with solvent membrane electrodes based on Silver ionophore VII.

Recommended Membrane Composition

1.0	wt%	Silver ionophore VII (44042)
66.0	wt%	Bis(2-ethylhexyl) adipate (02138)
33.0	wt%	Poly(vinyl chloride) high molecular weight (81392)

Recommended Cell Assembly

Reference || sample solution || liquid membrane | 0.1 M KCl | AgCl, Ag

Electrode Characteristics and Function

Selectivity Coefficients $\log K_{Ag, M}^{Pot}$ as obtained by the separate solution method (0.01 M solutions of nitrates, pH 4.5 (0.01M Mg-Acetate buffer)).

$\log K_{Ag, Hg}^{Pot}$	0.1	$\log K_{Ag, Na}^{Pot}$	-1.0
$\log K_{Ag, Mg}^{Pot}$	-3.4	$\log K_{Ag, Pb}^{Pot}$	-1.7
$\log K_{Ag, Zn}^{Pot}$	-2.9	$\log K_{Ag, Ni}^{Pot}$	-2.5

Slope of linear regression: 55.2 mV/dec ($4 \cdot 10^{-10}$ to $1 \cdot 10^{-2}$ M $AgNO_3$)
 Detection limit: $2 \cdot 10^{-10}$ M Ag^+

³ J.H. On, K.T. Cho, Y. Park, S. Hahm, W. Kim, J.Y. Cho, J.H. Hwang, Y.M. Jun, G.S. Cha, H. Nam, B.H. Kim, Synthesis of 7-deoxycholic amides or cholanes containing distinctive ion-recognizing groups at C3 and C12 and evaluation for ion-selective ionophores. **Tetrahedron** **65**, 1415 (2009).

Optical Transduction

Application and Sensor Type ⁴

Determination of silver and mercury with ion-selective optode membranes based on Silver ionophore III.

Recommended Membrane Composition

0.88	wt%	Chromoionophore VII (ETH 5418) (27097)
2.11	wt%	Silver ionophore III (15336)
1.24	wt%	Potassium tetrakis[3,5-bis(trifluoromethyl)phenyl]borate (60588)
63.84	wt%	Bis(2-ethylhexyl) sebacate (84818)
31.92	wt%	Poly(vinyl chloride) high molecular weight (81392)

Recommended pH Buffer

10⁻³ M Mg(OAc)₂, pH 4.7

Absorbance Maxima of Chromoionophore VIII in Polymeric Optode Membranes

$\lambda^{\max}_{deprot.}$: 521 nm	$\lambda^{\max}_{prot.}$: 665 nm
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Optode Characteristics and Function

Selectivity Coefficients $\log K_{Ag, M}^{Opt}$ as obtained by the separate solution method, normalised to pH 4.7

$\log K_{Ag, Hg}^{Opt}$	0.7	$\log K_{Ag, Pb}^{Opt}$	-13.4
$\log K_{Ag, K}^{Opt}$	-9.3	$\log K_{Ag, Cu}^{Opt}$	-9.6
$\log K_{Ag, Li}^{Opt}$	-11.2	$\log K_{Ag, Cd}^{Opt}$	-14.6
$\log K_{Ag, Na}^{Opt}$	-9.9		

Detection limit: 2.5•10⁻⁹ M Ag⁺ at pH 4.7 (ion background of 3.3•10⁻⁴ M Mg(OAc)₂).

⁴ M. Lerchi, E. Reitter, W. Simon, E. Pretsch, D.A. Chowdhury, S. Kamata, Bulk Optodes Based on Neutral Dithiocarbamate Ionophores with High Selectivity and Sensitivity for Silver and Mercury Cations. **Anal. Chem.** **66**, 1713 (1994).