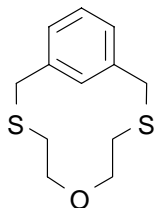


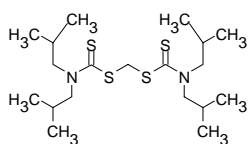
Silver



Silver ionophore II

(MAO; 6-Oxa-3,9-dithiabicyclo[9.3.1]pentadeca-1(15),11-13-triene)
 $C_{12}H_{16}OS_2$ $M_r = 240.32$ [130184-19-9]

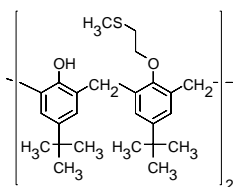
[85208](#) Selectophore[®], function tested 50 mg



Silver ionophore III

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

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



Silver ionophore IV

(O,O''-Bis[2-(methylthio)ethyl]-*tert*-butylcalix[4]arene)
 $C_{50}H_{68}O_4S_2$ $M_r = 797.21$ [145237-25-8]

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

Electrochemical Transduction

- Ion-Selective Electrodes

Optical Transduction

Electrochemical Transduction

Ion-Selective Electrodes

Application 1 and Sensor Type ^{1,2,3}

Assay of Ag⁺ activity with ion-selective electrodes of the polymer composite-substrate all-solid PVC matrix membrane type based on Silver ionophore II.

Recommended Membrane Composition

7.00	wt%	Silver ionophore II (85208)
31.00	wt%	Bis(2-ethylhexyl) phthalate (80030)
62.00	wt%	Poly(vinyl chloride) high molecular weight (81392)

A conductive polymer composite (graphite-loaded epoxy resin⁴) was used as solid internal contact.

Recommended Cell Assembly

Reference | | sample solution | | liquid membrane | | solid internal contact

Electrode Characteristics and Function

Selectivity coefficients $\log K_{Ag, M}^{Pot}$ as obtained by the mixed solution method (fixed interference method; 0.1 M solutions for all ions, except for Hg²⁺ 10⁻⁵ M).

$\log K_{Ag, Hg}^{Pot}$	-2.3	$\log K_{Ag, Ca}^{Pot}$	-4.9
$\log K_{Ag, K}^{Pot}$	-4.8	$\log K_{Ag, Sr}^{Pot}$	-5.0
$\log K_{Ag, Na}^{Pot}$	-4.9	$\log K_{Ag, Co}^{Pot}$	-5.6
$\log K_{Ag, Cu}^{Pot}$	-4.9	$\log K_{Ag, Mg}^{Pot}$	-5.3
$\log K_{Ag, Ni}^{Pot}$	-4.9	$\log K_{Ag, Zn}^{Pot}$	-5.6
$\log K_{Ag, Pb}^{Pot}$	-4.9	$\log K_{Ag, Cd}^{Pot}$	-5.4

Slope of linear regression: 59 mV (10⁻⁶ to 10⁻¹ M AgNO₃)

Detection limit: 3·10⁻⁷ M Ag⁺

pH range: pH 2.5-8.5 (measured in 10⁻³ M AgNO₃ solution)

Response time: < 5 s

Life time: > 13 months

¹ J. Casabó, C. Perez-Jimenez, L. Escriche, S. Aegret, E. Martinez-Fabregas, F. Teixidor, Silver(I) Ion Selective Electrode Based on Dithiamacrocycles. **Chem. Lett.** 1107 (1990).

² J. Casabó, L. Mestres, L. Escriche, F. Teixidor, C. Perez-Jimenez, Silver(I) ion-selective electrodes based on polythiamacrocycles. **J. Chem. Soc. Dalton Trans.** 1969 (1991).

³ J. Casabó, F. Teixidor, L. Escriche, C. Viñas, C. Pérez-Jiménez, Silver-Selective Electrode Based on Supported Liquid Membranes, **Adv. Mater.** 7, 238 (1995).

⁴ S. Alegret, E. Martinez-Fabregas, Biosensors based on conducting filled polymer all-solid-state PVC matrix membrane electrodes. **Biosensors** 4, 287 (1989).

Application 2 and Sensor Type ⁵

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

Recommended Membrane Composition

1.00	wt%	Silver ionophore IV (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 (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)

⁵ 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).

Optical Transduction

Application and Sensor Type ⁶

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

$\lambda_{\text{deprot.}}^{\text{max}}$: 521 nm	$\lambda_{\text{prot.}}^{\text{max}}$: 665 nm
---	----------	---------------------------------------	----------

Optode Characteristics and Function

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

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

⁶ 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).