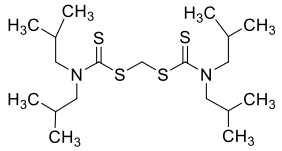
Product Information



15336 Silver ionophore III

(Lead ionophore II, *S*,*S*'-Methylenebis(*N*,*N*-iisobutyldithiocarbamate)
Selectophore®, function tested

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(*p*-chlorophenyl)borate (KT*p*ClPB) (60591)
65.53 wt%	Bis(1-butylpentyl) adipate (02150)
33.00 wt%	Poly(vinyl chloride) high molecular weight (81392)

Recommended Cell Assembly

Ag,AgCl, 0.1 M KCl | 0.1 M KNO_3 || sample solution || liquid membrane | 0.005 M $AgNO_3$, 0.01 M HNO_3 (pH 2)

Electrode Characteristics and Function

Selectivity coefficients $\log K_{Ag,M}^{Pot}$ as obtained by the fixed interference method (0.1 M solns. 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 Ag NO_3
Detection limit:	$4 \cdot 10^{-6}$ M Ag^+
pH range:	>2.5
Response time:	<10 s
Drift:	-0.36 mV/d (measured in 0.01 M Ag NO_3 solution)

Application 2 and Sensor Type[2,3]

Lead-selective solvent polymeric membrane electrode based on Lead ionophore II.

Recommended Membrane Composition

11.20 wt%	Lead ionophore II (15336)
2.00 wt%	Potassium tetrakis(*p*-chlorophenyl)borate (KT*p*ClPB) (60591)
49.60 wt%	2-Nitrophenyl octyl ether (73732)
37.20 wt%	Poly(vinyl chloride) high molecular weight (81392)

Recommended Cell Assembly

Reference || sample solution || liquid membrane | 0.001 M $PbCl_2$ | AgCl, Ag

Electrode Characteristics and Function

Selectivity coefficients $\log K_{Pb,M}^{Pot}$ as obtained by the mixed solution method (concentration of the interfering ions are 0.1 M except for Cu (10^{-5} M), Fe and Zn (10^{-3} M). Measured in $Pb(NO_3)_2$ solution of 10^{-1} to 10^{-8} M).

$\log K_{Pb,Na}^{Pot}$	-2.14	$\log K_{Pb,Mn}^{Pot}$	-5.21
$\log K_{Pb,K}^{Pot}$	-2.20	$\log K_{Pb,Ca}^{Pot}$	-5.45
$\log K_{Pb,Fe}^{Pot}$	-2.54	$\log K_{Pb,Mg}^{Pot}$	-5.26
$\log K_{Pb,Zn}^{Pot}$	-3.50	$\log K_{Pb,Sr}^{Pot}$	-5.25
$\log K_{Pb,Cd}^{Pot}$	-3.57	$\log K_{Pb,Cr}^{Pot}$	-4.6
$\log K_{Pb,Ni}^{Pot}$	-5.0	$\log K_{Pb,Cu}^{Pot}$	0.7
$\log K_{Pb,Co}^{Pot}$	-5.2		

Slope of linear regression**:**	28 mV/dec (10^{-6} to 10^{-2} M $Pb(NO_3)_2$)
Detection limit:	$3.5 \cdot 10^{-7}$ M
Response time:	95% response time 16 s (10^{-3} to 10^{-2} M $Pb(NO_3)_2$)
pH range:	3.1-5.4 (measured in 10^{-3} M $Pb(NO_3)_2$ solution)

Chemically modified Electrodes

Application 1 and Sensor Type[4]

Lead-selective glassy carbon electrodes for accumulation voltammetry based on Lead ionophore II. With this chemically modified electrode (CME) mmol concentration of Pb(II) can be detected.

Recommended Membrane Composition

Solution A:	$5 \cdot 10^{-3}$ M Lead ionophore II (15336) in 2-propanol
Solution B:	Nafion (5% solution in lower aliphatic alcohols and water) (70160) diluted to 1% with methanol

Coating solutions:

2 µL	Solution A
2 µL	Solution B
10 µL	Methanol

A glassy carbon electrode is polished on Al_2O_3 slurry, sonicated in methanol, air-dried and coated with the solution at an area of 0.38 cm^3. This corresponds to a coating with 10 mmol Lead ionophore II and 20 µg Nafion with a calculated film thickness of 0.39 µm.

Electrode Characteristics and Function

Accumulation of Pb(II) from 0.1 M acetate buffer (pH 4) followed by voltammetry gave a quasi-reversible reduction peak at –0.85 V.

Half-wave potential:	$E_{1/2}$: -0.57 V
Peak to peak separation:	ΔE_P = 0.51 V
Linear response range:	$5 \cdot 10^{-7}$ M to $6 \cdot 10^{-6}$ M Pb^{2+} (120 s accumulation)
Detection limit:	10^{-7} M Pb^{2+} (with 600s accumulation)
Interference:	Ca^{2+}, Mg^{2+}, Ni^{2+}, Cu^{2+}, Cd^{2+}, Ag^{+} and Hg^{2+} are the most highly interfering species.

Optical Transduction
Ion-Selective Electrodes

Application 1 and Sensor Type[5]
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 VII in Polymeric Optode Membranes

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

Optode Characteristics and Function
Selectivity coefficients $\log K_{Ag,M}^{Opt}$ as obtained by the separate solution method, normalized to pH 4.7.

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

Detection limit: $2.5 \cdot 10^{-9}$ M Ag^+ at pH 4.7 (ion background of $3.3 \cdot 10^{-4}$ M $(Mg(OAc)_2)$.

[1] Silver selective electrodes based on thioether functionalized calix[4]arenes as ionophores. E. Malinowska, Z. Brzozka, K. Kasiura, R.J.M. Egberink, D.N. Reinhoudt, Anal. Chim. Acta 298, 245 (1994).
[2] Lead-selective membrane electrode using methylene bis(diisobutyldithiocarbamate) neutral carrier. S. Kamata, K. Onoyama, Anal. Chem. 63, 1295 (1991).
[3] Methylene Bis(diisobutyldithiocarbamate) Neutral Carrier as Lead Sensing Material. S. Kamata, K. Onoyama, Chem. Lett. 653 (1991).
[4] Lead-selective bulk optodes based on neutral ionophores with subnanomolar detection limits. M. Lerchi, E. Bakker, B. Rusterholz, W. Simon, Anal. Chem. 64,1534 (1992).
[5] Bulk Optodes Based on Neutral Dithiocarbamate Ionophores with High Selectivity and Sensitivity for Silver and Mercury Cations. M. Lerchi, E. Reitter, W. Simon, E. Pretsch, D.A. Chowdhury, S. Kamata, Anal. Chem. 66, 1713 (1994).