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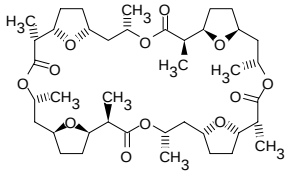
Urea



Ammonium ionophore I

(Nonactin*)

$C_{40}H_{64}O_{12}$ M_r 736.95 [6833-84-7]

09877	**Selectophore®, function tested**	50 mg, 250 mg

* purified and tested for the use in NH_4^+-selective electrodes

Electrochemical Transduction

- **Ion-Selective Electrodes**

Optical Transduction

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Electrochemical Transduction

Ion-Selective Electrodes

Application 1 and Sensor Type [1,2]

Assay of NH_4^+ activity derived from enzymatic decomposition of urea with solvent polymeric membrane electrodes based on Ammonium ionophore I.

*Please note, this **Selectophore®** grade ionophore has been especially purified and tested for use in NH_4^+-selective electrodes.*

Recommended Membrane Composition

0.60	wt%	Ammonium ionophore I (09877)
0.50	wt%	Tetraheptylammonium tetraphenylborate (87293)
63.60	wt%	Dibutyl sebacate (84838)
35.30	wt%	Poly(vinyl chloride) high molecular weight (81392)

Recommended Cell Assembly

Reference ‖ sample solution ‖ ion-selective membrane | 0.001 M NH_4Cl | AgCl, Ag

Electrode Characteristics and Function

Slope of linear regression: 53 mV ($4 \cdot 10^{-6}$ to $6 \cdot 10^{-3}$ M NH_4^+ in 0.02 M TRIS/HCl, 10^{-3} M Na_2EDTA; pH 8)
Electrical resistance: ~$3 \cdot 10^4$ Ω

Application 2 and Sensor Type [3]

Assay of NH_4^+ activity in an urea sensor which uses enzyme immobilisation on a nylon net together with a specially designed ammonium ion-selective field-effect transistor, coated with a solvent polymer membrane based on Ammonium ionophore I.

Recommended Membrane Composition

0.99	wt%	Ammonium ionophore I (09877)
0.60	wt%	Potassium tetrakis(4-chlorophenyl)borate (60591)
68.49	wt%	Tetraundecyl benzhydrol-3,3',4,4'-tetracarboxylate (ETH 2112) (12103)
29.82	wt%	Poly(vinyl chloride) high molecular weight (81392)

Recommended pH Buffer

0.001 M TRIS/HCl buffer; pH 7.3

Electrode Characteristics

Slope of linear regression: 57 mV (10^{-4} to $3 \cdot 10^{-3}$ M urea)
Response time: 38s
Lifetime: >20d

Application 3 and Sensor Type [4]

Assay of NH_4^+ activity derived from enzymatic decomposition of urea with solvent polymeric membrane electrodes based on Ammonium ionophore I.

Recommended Membrane Composition

4.00	wt%	Ammonium ionophore I (09877)
2.00	wt%	Palmitic acid (76120)
64.00	wt%	Bis(2-ethyl)hexyl sebacate (DOS) (84818)
30.00	wt%	Poly(vinyl chloride) high molecular weight (81392)

Recommended pH Buffer

Trizma base pH 7.00

Electrode Characteristics

Slope of linear regression: 54.3±0.4 mV ($1.0 \cdot 10^{-5}$ to $1.0 \cdot 10^{-2}$ M) urea; 54.8±0.1 mV ($1.0 \cdot 10^{-6}$ to $1.0 \cdot 10^{-1}$ M) NH_4^+
Response time: < 1 min
Lifetime: >2 months

[1] S. Bilal Butt, K. Cammann, Enzyme Urea Biosensor Based on a Modified Potentiometric PVC-Nonactin Membrane Electrode for Assay of Urea in Blood. **Anal. Lett. *25***, 1597 (1992).
[2] J.G. Schindler et al. Eur. Urea sensor for the continuous ammonium-selective enzymatic process control of the artificial kidney. **J. Clin. Chem .Clin. Biochem. *32***, 145 (1994).
[3] S. Alegret, J. Bartolí, C. Jiménez, E. Martinez-Fabregas, D. Màrtorell, F. Valdés-Perezgasga, ISFET-based urea biosensor. **Sens. Actuators *B15-16***, 453 (1993).
[4] E. Karakus, S. Pekyardimci, E. Kilic, Urea Biosensors Based on PVC Membrane Containing Palmitic Acid, **Artificial Cells, Blood Substitutes, and Biotechnology *33***, 329 (2005).

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Optical Transduction

Application 1 and Sensor Type [5]
Assay of NH_4^+ activity in urea-sensitive reverse micelle based biooptode membranes. The ammonium-selective optode membrane contains Ammonium ionophore I and Chromoionophore III (ETH 5350).

Recommended Membrane Composition

0.37	wt%	Chromoionophore III (27088)
0.46	wt%	Ammonium ionophore I (09877)
0.62	wt%	Sodium tetrakis[3,5-bis(trifluoromethyl)phenyl]borate (72017)
5.76	wt%	Sodium bis(2-ethylhexyl)sulfosuccinate (86139)
0.49	wt%	Cyclohexanone (29135)
0.79	wt%	Urease (94278)
0.01	wt%	Water (95283)
58.70	wt%	Nitrophenyl octyl ether (NPOE) (73732)
32.80	wt%	Poly(vinyl chloride) high molecular weight (81392)

Recommended pH Buffer
0.018 M LiOH adjusted with phosphoric acid to pH 7.55

Optode Characteristics
Dynamic measuring range: 10^{-5} to 10^{-1} M urea at pH 7.55¨
Response time: 95% response time 1-3.5 min

Application 2 and Sensor Type [6]
Determination of urea based on the measurement of NH_4^+ produced through enzymatic decomposition of urea, using fluorescence detection. The solvent polymeric optode membrane contains Ammonium ionophore I and Chromoionophore I.

Recommended Membrane Composition

9.50	wt%	Ammonium ionophore I (09877)
5.59	wt%	Chromoionophore I (27086)
4.47	wt%	Potassium tetrakis(4-chlorophenyl)borate (60591)
53.63	wt%	Bis(2-ethylhexyl)sebacate (84818)
26.81	wt%	Poly(vinyl chloride) high molecular weight (81392)

Recommended pH Buffer
10 or 200 mM TRIS/HCl buffer; pH 7.24.

Optode Characteristics
Dynamic range: 30 µM to 10 mM NH_4^+
Detection limit: 0.03 to 0.6 mM at near neutral pH
Response time: 4 min (enzyme membrane thickness 150 µm)

Application 3 and Sensor Type [7]
Determination of urease activity based on the measurement of NH_4^+ produced through enzymatic decomposition of urea. This biosensor of urea incorporates an ammonium-selective bulk optode membrane containing Ammonium ionophore I and Chromoionophore III.

Recommended Membrane Composition

0.47	wt%	Ammonium ionophore I (09877)
0.43	wt%	Chromoionophore III (27088)
0.53	wt%	Sodium tetrakis[3,5-bis(trifluoromethyl)phenyl]borate (72017)
66.25	wt%	2-Nitrophenyl octyl ether (73732)
32.26	wt%	Poly(vinyl chloride) high molecular weight (81392)

Recommended pH Buffer
0.029 M NaOH/0.05 M NaH_2PO_4, pH 7.0.

Optode Characteristics
Dynamic range: 10^{-4} to 10^{-1} M NH_4Cl at pH 7.0
Detection limit: 0.03 to 0.6 mM at near neutral pH
Response time: 95% response time 0.5-2 min

[5] E. Vaillo, P. Walder, U.E. Spichiger, Development of micellar bioptodes membranes. **Anal. Meth. Instrum. *2***, 145 (1995).
[6] O.S. Wolfbeis, H.Li, Fluorescence optical urea biosensor with an ammonium optrode as transducer. **Biosens. Bioelectroncis *8***, 161 (1993).
[7] C. Stamm, K. Seiler, W. Simon, Enzymatic biosensor for urea based on an ammonium ion-selective bulk optode membrane. **Anal. Chim. Acta *282***, 239 (1993).