

Table 19: UO₂²⁺-Selective Electrodes

ionophore	membrane composition	lgK _{UO₂²⁺,Bⁿ⁺}	method	primary ion conc. (M)	interfering ion conc. (M)	slope (mV/decade)	linear range (M)	remarks	ref.
UO ₂ ²⁺ -1	UO ₂ ²⁺ -1 (<i>w</i> = 3 %), DBP (<i>w</i> = 12 %), PVC (<i>w</i> = 83 %), NaTPB (<i>x</i> _i = 56 %)	Na ⁺ , -1.77; Na ⁺ , -2.46; Ba ²⁺ , -2.01; Ni ²⁺ , -1.44; Cu ²⁺ , -2.82; Fe ³⁺ , -2.08 (pH = 2.0); Al ³⁺ , -2.24; Cl ⁻ , -2.89; SO ₄ ²⁻ , -2.60; Cr ₂ O ₇ ²⁻ , -2.19	FPM	–	–	59	10 ⁻⁴ –10 ⁻¹	$\tau > 30$ d; <i>c</i> _{dl} = 1 × 10 ⁻⁶ M; pH = 3.0	[1]
UO ₂ ²⁺ -2	UO ₂ ²⁺ -2 (<i>w</i> = 1 %), oNPOE (<i>w</i> = 67 %), PVC (<i>w</i> = 32 %)	Li ⁺ , -1.00; Na ⁺ , -0.68; K ⁺ , -0.85; NH ₄ ⁺ , -0.92; Mg ²⁺ , -0.80; Ca ²⁺ , -0.92; Sr ²⁺ , -0.89; Ba ²⁺ , -1.05; Mn ²⁺ , -1.05; Fe ²⁺ , -1.00; Fe ³⁺ , +0.52; Co ²⁺ , -1.00; Ni ²⁺ , -0.96; Cu ²⁺ , -1.30; Zn ²⁺ , -1.30; Cd ²⁺ , -1.00	SSM	10 ⁻⁴	10 ⁻⁴	39.4	10 ^{-5.4} –10 ⁻³	25.0 ± 0.1 °C; [2] <i>c</i> _{dl} = 2.5 × 10 ⁻⁴ M; <i>t</i> _{resp} < 1 min	[2]
		Li ⁺ , -2.44; Na ⁺ , -2.11; K ⁺ , -1.70; NH ₄ ⁺ , -2.09; Mg ²⁺ , -2.52; Ca ²⁺ , -2.64; Sr ²⁺ , -2.64; Ba ²⁺ , -2.68; Mn ²⁺ , -2.80; Fe ²⁺ , -2.10; Fe ³⁺ , -0.23; Co ²⁺ , -2.77; Ni ²⁺ , -2.04; Cu ²⁺ , -2.02; Zn ²⁺ , -2.46; Cd ²⁺ , -2.77	SSM	10 ⁻²	10 ⁻²	–	–	after 5 months dry storage	
		K ⁺ , -0.77; Mg ²⁺ , -1.15; Fe ²⁺ , -1.10; Fe ³⁺ , +0.48	SSM	10 ⁻⁴	10 ⁻⁴	–	–		
		K ⁺ , -1.70; Mg ²⁺ , -2.49; Fe ²⁺ , -2.00; Fe ³⁺ , -0.19	SSM	10 ⁻²	10 ⁻²	–	–		
	UO ₂ ²⁺ -2 (<i>w</i> = 1 %), DOPP (<i>w</i> = 67 %), PVC (<i>w</i> = 32 %)	Li ⁺ , -5.17 Na ⁺ , -1.42; K ⁺ , -3.34; NH ₄ ⁺ , -1.39; Mg ²⁺ , -5.96; Ca ²⁺ , -1.85; Sr ²⁺ , -2.24; Ba ²⁺ , -1.68; Mn ²⁺ , -2.40; Fe ²⁺ , -1.42; Fe ³⁺ , +0.90; Co ²⁺ , -2.40; Ni ²⁺ , -1.54; Cu ²⁺ , -1.39; Zn ²⁺ , -1.45; Cd ²⁺ , -1.89	SSM	10 ⁻⁴	10 ⁻⁴	13.2	10 ^{-5.4} –10 ⁻³	25.0 ± 0.1 °C; [2] <i>c</i> _{dl} = 6.0 × 10 ⁻⁴ M; <i>t</i> _{resp} < 1 min	[2]
		Li ⁺ , -4.55; Na ⁺ , -3.21; K ⁺ , -4.71; NH ₄ ⁺ , -2.66; Mg ²⁺ , -6.88; Ca ²⁺ , -3.84; Sr ²⁺ , -4.24; Ba ²⁺ , -2.87;	SSM	10 ⁻²	10 ⁻²	–	–		

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Table 19: UO₂²⁺-Selective Electrodes (*Continued*)

ionophore	membrane composition	$\lg K_{\text{UO}_2^{2+}, \text{B}^{\text{n}+}}$	method	primary ion conc. (M)	interfering ion conc. (M)	slope (mV/decade)	linear range (M)	remarks	ref.
		Mn ²⁺ , -4.55; Fe ²⁺ , -1.22 Fe ³⁺ , +1.54; Co ²⁺ , -4.54; Ni ²⁺ , -1.74; Cu ²⁺ , -2.64; Zn ²⁺ , -2.81; Cd ²⁺ , -3.96							
		K ⁺ , -2.00; Fe ²⁺ , -1.39; Fe ³⁺ , +0.93	SSM	10 ⁻⁴	10 ⁻⁴	-	-	after 6 months in 0.1 M UO ₂ Cl ₂	
		K ⁺ , -2.02; Fe ²⁺ , -1.30; Fe ³⁺ , +1.57	SSM	10 ⁻²	10 ⁻²				
	UO ₂ ²⁺ -2 (<i>w</i> = 1 %), DOPP (<i>w</i> = 67 %), PVC (<i>w</i> = 31 %), NaTPB (<i>x</i> ₁ = 119 %)	Li ⁺ , -1.34; Na ⁺ , -1.11; K ⁺ , -0.93; NH ₄ ⁺ , -1.62; Mg ²⁺ , -1.80; Ca ²⁺ , -1.60; Sr ²⁺ , -1.66; Ba ²⁺ , -1.92; Mn ²⁺ , -1.31; Fe ²⁺ , -1.28; Fe ³⁺ , -1.05; Co ²⁺ , -1.31; Ni ²⁺ , -0.96; Cu ²⁺ , -1.12; Zn ²⁺ , -0.80; Cd ²⁺ , -1.03	SSM	10 ⁻⁴	10 ⁻⁴	22.7	10 ^{-5.4} -10 ⁻³	25.0 ± 0.1 °C; [2] <i>c</i> _{dl} = 3.0 × 10 ⁻⁴ M; <i>t</i> _{resp} < 1 min	
		Li ⁺ , -2.44; Na ⁺ , -2.14; K ⁺ , -2.68; NH ₄ ⁺ , -3.96; Mg ²⁺ , -3.60; Ca ²⁺ , -3.35; Sr ²⁺ , -3.51; Ba ²⁺ , -1.92; Mn ²⁺ , -2.96; Fe ²⁺ , -3.44; Fe ³⁺ , -2.28; Co ²⁺ , -2.96; Ni ²⁺ , -2.51; Cu ²⁺ , -2.60; Zn ²⁺ , -2.46; Cd ²⁺ , -2.70	SSM	10 ⁻²	10 ⁻²	-	-		
		K ⁺ , -0.96; Mg ²⁺ , -1.64; Fe ²⁺ , -1.20; Fe ³⁺ , -0.54	SSM	10 ⁻⁴	10 ⁻⁴	-	-	after 6 months in 0.1 M UO ₂ Cl ₂	
		K ⁺ , -2.92; Mg ²⁺ , -2.45; Fe ²⁺ , -1.52; Fe ³⁺ , -1.27	SSM	10 ⁻²	10 ⁻²				
UO ₂ ²⁺ -3	UO ₂ ²⁺ -3, oNPOE, PVC, NaTPB (weight ratio not given)	Na ⁺ , -4.4; K ⁺ , -4.7; Mg ²⁺ , -4.2; Ca ²⁺ , -4.2; Ba ²⁺ , -4.2; Co ²⁺ , -4.1; Ni ²⁺ , -3.9; Cu ²⁺ , -4.2; Al ³⁺ , -4.7; Fe ³⁺ , -3.1	FIM	-	0.1	30	10 ⁻⁵ -10 ⁻³	pH = 2.70 ± 0.05; [3] <i>c</i> _{dl} = 2.5 × 10 ⁻⁴ M; <i>t</i> _{resp} < 1 min	

Table 19: UO₂²⁺-Selective Electrodes (Continued)

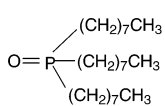
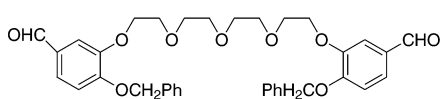
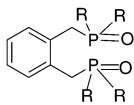
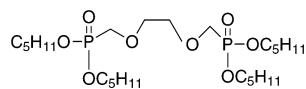
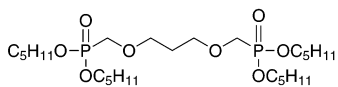
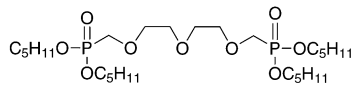
ionophore	membrane composition	lgK _{UO₂²⁺,Bⁿ⁺}	method	primary ion conc. (M)	interfering ion conc. (M)	slope (mV/decade)	linear range (M)	remarks	ref.
	UO₂²⁺-3 (<i>w</i> = 1 %), oNPOE (<i>w</i> = 65.5 %), PVC (<i>w</i> = 33 %), NaTpCIPB (<i>x</i> ₁ = 59 %)	Na ⁺ , -0.60; K ⁺ , -0.19 Mg ²⁺ , -1.96; Ca ²⁺ , -1.74	FIM	–	0.1	18 ± 1	10 ⁻⁴ –10 ⁻¹	pH = 3.0; <i>c</i> _{dl} = 6.3 × 10 ⁻⁵ M	[4]
UO₂²⁺-4	UO₂²⁺-4 (<i>w</i> = 1 %), oNPOE (<i>w</i> = 66 %), PVC (<i>w</i> = 33 %)	Li ⁺ , -1.24; Na ⁺ , -1.27; K ⁺ , -1.28; NH ₄ ⁺ , -1.46; Mg ²⁺ , -1.51; Ca ²⁺ , -1.60; Sr ²⁺ , -1.74; Ba ²⁺ , -1.54; Mn ²⁺ , -1.25; Co ²⁺ , -1.32; Ni ²⁺ , -1.20; Cu ²⁺ , -1.74; Zn ²⁺ , -1.15; Cd ²⁺ , -1.58; Al ³⁺ , -1.72	FIM	–	0.1	–	–	pH = 3.0; <i>c</i> _{dl} = 2.8 × 10 ⁻⁵ M	[4]
	UO₂²⁺-4 (<i>w</i> = 1 %), oNPOE (<i>w</i> = 65.9 %), PVC (<i>w</i> = 33 %), NaTpCIPB (<i>x</i> ₁ = 9 %)	Li ⁺ , -2.14; Na ⁺ , -2.19; K ⁺ , -2.24; NH ₄ ⁺ , -3.06; Mg ²⁺ , -3.16; Ca ²⁺ , -3.00; Sr ²⁺ , -2.68; Ba ²⁺ , -3.19; Mn ²⁺ , -2.25; Co ²⁺ , -2.28; Ni ²⁺ , -2.48; Cu ²⁺ , -2.49; Zn ²⁺ , -2.32; Cd ²⁺ , -3.42; Al ³⁺ , -2.39	FIM	–	0.1	–	–	pH = 3.0;	[4]
	UO₂²⁺-4 (<i>w</i> = 1 %), oNPOE (<i>w</i> = 65.5 %), PVC (<i>w</i> = 33 %), NaTpCIPB (<i>x</i> ₁ = 44 %)	Li ⁺ , -3.04; Na ⁺ , -3.03; K ⁺ , -3.00; NH ₄ ⁺ , -3.26; Mg ²⁺ , -3.14; Ca ²⁺ , -3.12; Sr ²⁺ , -3.70; Ba ²⁺ , -3.74; Mn ²⁺ , -2.92; Co ²⁺ , -3.05; Ni ²⁺ , -3.07; Cu ²⁺ , -2.96; Zn ²⁺ , -2.60; Cd ²⁺ , -3.92; Al ³⁺ , -2.92	FIM	–	0.1	29 ± 1	10 ⁻⁴ –10 ⁻¹	pH = 3.0; <i>c</i> _{dl} = 2.8 × 10 ⁻⁵ M	[4]
	UO₂²⁺-4 (<i>w</i> = 1 %), oNPOE (<i>w</i> = 65 %), PVC (<i>w</i> = 33 %), NaTpCIPB (<i>x</i> ₁ = 89 %)	Li ⁺ , -1.07; Na ⁺ , -1.13; K ⁺ , -1.07; NH ₄ ⁺ , -1.19; Mg ²⁺ , -3.13; Ca ²⁺ , -2.28; Sr ²⁺ , -2.32; Ba ²⁺ , -3.13; Mn ²⁺ , -2.17; Co ²⁺ , -2.18; Ni ²⁺ , -2.28; Cu ²⁺ , -2.21; Zn ²⁺ , -2.27; Cd ²⁺ , -3.33; Al ³⁺ , -2.14	FIM	–	0.1	–	–	pH = 3.0	[4]

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Table 19: UO₂²⁺-Selective Electrodes (*Continued*)

ionophore	membrane composition	lgK _{UO₂²⁺,Bⁿ⁺}	method	primary ion conc. (M)	interfering ion conc. (M)	slope (mV/decade)	linear range (M)	remarks	ref.
	UO ₂ ²⁺ -4 (<i>w</i> = 1 %), DBP (<i>w</i> = 65.5 %), PVC (<i>w</i> = 33 %), NaTpCIPB (<i>x</i> _i = 44 %)	Na ⁺ , -0.57; K ⁺ , -0.09; Mg ²⁺ , -1.68; Ca ²⁺ , -1.49	FIM	–	0.1	–	–	pH = 3.0; <i>c</i> _{dl} = 2.8 × 10 ⁻⁵ M; <i>τ</i> ≈ 120 d	[4]
	UO ₂ ²⁺ -4 (<i>w</i> = 1 %), DBS (<i>w</i> = 65.5 %), PVC (<i>w</i> = 33 %), NaTpCIPB (<i>x</i> _i = 44 %)	Na ⁺ , -0.13; K ⁺ , +0.08; Mg ²⁺ , -0.46; Ca ²⁺ , -0.39	FIM	–	0.1	–	–	pH = 3.0	[4]
UO ₂ ²⁺ -5	UO ₂ ²⁺ -5 (<i>w</i> = 1 %), oNPOE (<i>w</i> = 65.5 %), PVC (<i>w</i> = 33 %), NaTpCIPB (<i>x</i> _i = 51 %)	Na ⁺ , -0.17; K ⁺ , -0.04; Mg ²⁺ , -1.50; Ca ²⁺ , -1.17	FIM	–	0.1	11 ± 1	10 ⁻³ –10 ⁻²	pH = 3.0; <i>c</i> _{dl} = 3.5 × 10 ⁻⁴ M	[4]
UO ₂ ²⁺ -6	UO ₂ ²⁺ -6 (<i>w</i> = 1 %), oNPOE (<i>w</i> = 65.5 %), PVC (33 %), NaTpCIPB (<i>x</i> _i = 53 %)	Na ⁺ , -0.38; K ⁺ , -0.17; Mg ²⁺ , -1.60; Ca ²⁺ , -1.44	FIM	–	0.1	14 ± 1	10 ⁻³ –10 ⁻²	pH = 3.0; <i>c</i> _{dl} = 1.0 × 10 ⁻⁴ M	[4]
UO ₂ ²⁺ -7	UO ₂ ²⁺ -7 (0.1M), nitrobenzene, NaTPB (0.1 M)	Li ⁺ , -3.4; Na ⁺ , -4.5; Mg ²⁺ , -2.4; Ca ²⁺ , -1.6; Ba ²⁺ , -1.4; Cu ²⁺ , -2.9; Cd ²⁺ , -2.2; Pb ²⁺ , -3.6; Th ²⁺ , -0.2	SSM biionic potential method	0.01	0.01	29.8 ± 1.5	10 ⁻⁵ –10 ⁻²	20 ± 1 °C; pH = 3	[5]
UO ₂ ²⁺ -8	UO ₂ ²⁺ -8 (0.1M), nitrobenzene, NaTPB (0.1 M)	Li ⁺ , -2.9; Na ⁺ , -3.6; Mg ²⁺ , -2.8; Ca ²⁺ , -2.3; Cu ²⁺ , -3.5; Cd ²⁺ , -2.3; Pb ²⁺ , -3.4; Th ²⁺ , -0.5	SSM biionic potential method	0.01	0.01	27.3 ± 0.6	10 ⁻⁵ –10 ⁻²	20 ± 1 °C; pH = 3	[5]
UO ₂ ²⁺ -9	UO ₂ ²⁺ -9 (0.1M), nitrobenzene, NaTPB (0.1 M)	Li ⁺ , -3.6; Na ⁺ , -3.4; Mg ²⁺ , -2.9; Ca ²⁺ , -2.2; Ba ²⁺ , -0.8; Cu ²⁺ , -3.0; Cd ²⁺ , -2.6; Pb ²⁺ , -3.5; Th ²⁺ , -0.8; H ⁺ , 3.1	SSM biionic potential method	0.01	0.01	27.4 ± 1.5	10 ⁻⁵ –10 ⁻²	20 ± 1 °C; pH = 3	[5]
	UO ₂ ²⁺ -9 (<i>w</i> = 4 %), oNPOE (<i>w</i> = 65 %), PVC (<i>w</i> = 30 %), NaTPB (<i>x</i> _i = 41 %)	Li ⁺ , -3.8; Na ⁺ , -2.8; Mg ²⁺ , -1.9; Ca ²⁺ , -1.3; Cu ²⁺ , -2.0; Cd ²⁺ , -1.9; Pb ²⁺ , -1.9; Th ²⁺ , -0.4	SSM	0.01	0.01	27.3 ± 1.0	10 ⁻⁵ –10 ⁻²	20 ± 1 °C; pH = 3	[5]

(1) C.-S. Luo, F.-C. Chang, Y.-C. Yeh, *Anal. Chem.*, **54**, 2333–2336 (1982).(2) A.C. Stevens, H. Freiser, *Anal. Chim. Acta*, **248**, 315–321 (1991).(3) S. Johnson, G.J. Moody, J.D.R. Thomas, F.H. Kohnke, J.F. Stoddart, *Analyst*, **114**, 1025–1028 (1989).(4) M.B. Saleh, *Ind. J. Chem.*, **31A**, 12–16 (1992).(5) A.N. Khramov, A.R. Garifzyanov, V.F. Toropova, *J. Anal. Chem. USSR*, **49**, 1010–1012 (1994).

Table 19: UO_2^{2+} -Selective Electrodes (Continued) UO_2^{2+-1} ($M_r = 386.65$) UO_2^{2+-2} ($M_r = 614.70$) UO_2^{2+-3} ($M_r = 562.63$): R = $-\text{C}_6\text{H}_4\text{CH}_3$ UO_2^{2+-4} ($M_r = 426.56$): R = $-\text{C}_4\text{H}_9$ UO_2^{2+-5} ($M_r = 490.56$): R = $-\text{OC}_4\text{H}_9$ UO_2^{2+-6} ($M_r = 506.53$): R = $-\text{C}_6\text{H}_5$  UO_2^{2+-7} ($M_r = 530.62$) UO_2^{2+-8} ($M_r = 544.65$) UO_2^{2+-9} ($M_r = 574.68$)