

**Table 1:** H<sup>+</sup>-Selective Electrodes

ionophore	membrane composition	$\lg K_{H^+,B^{n+}}$	method	primary ion conc. (M)	interfering ion conc. (M)	slope (mV/decade)	linear range (M)	remarks	ref.
<b>H<sup>+</sup>-1</b>	<b>H<sup>+</sup>-1</b> (w = 11.4 %), KTpCIPB (x <sub>i</sub> = 3.25 %), BEHS (w = 53.9 %), PVC (w = 33.1 %)	Na <sup>+</sup> , -3.0; K <sup>+</sup> , -2.4; Mg <sup>2+</sup> , -4.1; Ca <sup>2+</sup> , -3.8	FIM	–	0.1	–	–	–	[1]
<b>H<sup>+</sup>-2</b>	<b>H<sup>+</sup>-2</b> (w = 1.0 %), KTpCIPB (x <sub>i</sub> = 63 %), BEHS (w = 65.6 %), PVC (w = 32.8 %)	Na <sup>+</sup> , -10.4; K <sup>+</sup> , -9.8; Ca <sup>2+</sup> , <-11.1	FIM	–	1.0	57.8	10 <sup>-11.0</sup> –10 <sup>-4.5</sup>	20 °C	[2]
	<b>H<sup>+</sup>-2</b> (w = 1.0 %), DOS (w = 65.6 %), PVC (w = 32.8 %), NaTpCIPB (x <sub>i</sub> = 65 %)	Na <sup>+</sup> , -10.7; K <sup>+</sup> , -10.1	FIM	–	1.0	56.9	10 <sup>-10.0</sup> –10 <sup>-4.0</sup>	25 °C	[3]
	<b>H<sup>+</sup>-2</b> (w = 4.8 %), KTpCIPB (x <sub>i</sub> = 38 %), silicone rubber (w = 90.0 %), crosslinking agent KA-1 (w = 3.3 %)	Na <sup>+</sup> , <-11.2; K <sup>+</sup> , <-11.0; Ca <sup>2+</sup> , <-10.2	FIM	–	1.00 ± 0.3	60.9	3 × 10 <sup>-4</sup> –10 <sup>-11</sup>	20 °C	[4]
	<b>H<sup>+</sup>-2</b> (w = 2.3 %), DOS (w = 64.8 %), KTpCIPB (x <sub>i</sub> = 53 %), PVC (w = 32.4 %)	Na <sup>+</sup> , -10.70; K <sup>+</sup> , -10.50; Ca <sup>2+</sup> , -9.90	FIM	–	–	–	–	ISFET	[5]
	<b>H<sup>+</sup>-2</b> (w = 10 %), NaTPB (x <sub>i</sub> = 11 %), PVC (w = 25 %), DBS (w = 64 %)	Na <sup>+</sup> , -11.2; K <sup>+</sup> , -10.5; Ca <sup>2+</sup> , <-11.3	FIM	–	1.0	58.3	–		[6]
	<b>H<sup>+</sup>-2</b> (w = 10 %), NaTPB (x <sub>i</sub> = 11 %), DBS (w = 64.3 %), PVC-COOH (w = 25 %)	Na <sup>+</sup> , -11.0; K <sup>+</sup> , -10.5; Ca <sup>2+</sup> , <-11.1	FIM	–	1.0	59.0	–		[6]
	<b>H<sup>+</sup>-2</b> (w = 10 %), DBS (w = 64.3 %), PVC (w = 25 %), C <sub>10</sub> H <sub>21</sub> COOH (x <sub>i</sub> = 300 %), NaTPB (x <sub>i</sub> = 10.7 %)	Na <sup>+</sup> , -11.1; K <sup>+</sup> , -10.9; Ca <sup>2+</sup> , <-11.3	FIM	–	1.0	56.4	–		[6]
	<b>H<sup>+</sup>-2</b> (w = 10 %), DBS (w = 64.3 %), PVC-NH <sub>2</sub> (w = 25 %), NaTPB (x <sub>i</sub> = 10.7 %)	Na <sup>+</sup> , -11.0; K <sup>+</sup> , -10.7; Ca <sup>2+</sup> , <-11.3	FIM	–	1.0	55.8	–		[6]
	<b>H<sup>+</sup>-2</b> (w = 10 %), DBS (w = 64.3 %), PVC (w = 25 %), C <sub>18</sub> H <sub>37</sub> NH <sub>2</sub> (x <sub>i</sub> = 93 %), NaTPB (x <sub>i</sub> = 10.7 %)	Na <sup>+</sup> , -11.0; K <sup>+</sup> , -10.9; Ca <sup>2+</sup> , <-11.4	FIM	–	1.0	52.7	–		[6]
	<b>H<sup>+</sup>-2</b> (w = 10 %), NaTPB (x <sub>i</sub> = 11 %), oNPOE (w = 89.3 %)	Na <sup>+</sup> , -10.5; K <sup>+</sup> , -9.8; Ca <sup>2+</sup> , -11.1	–	–	–	64 57	10 <sup>-4</sup> –10 <sup>-6</sup> 10 <sup>-6</sup> –10 <sup>-10</sup>	t <sub>90</sub> = 10 s; microelec.	[7]
	<b>H<sup>+</sup>-2</b> , PVC (w ≈ 26 %), DBS (w = 66 %), NaTPB (w = 0.7 %)	Na <sup>+</sup> , -11.2; K <sup>+</sup> , -10.5; Ca <sup>2+</sup> , <-10.7	FIM	–	1.0 0.055	56.6	10 <sup>-10.7</sup> –10 <sup>-5.5</sup>		[8]

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**Table 1:** H<sup>+</sup>-Selective Electrodes (Continued)

ionophore	membrane composition	$\lg K_{H^+, B^{n+}}$	method	primary ion conc. (M)	interfering ion conc. (M)	slope (mV/decade)	linear range (M)	remarks	ref.
	<b>H<sup>+</sup>-2</b> ( <i>w</i> = 1.0 %), PVC ( <i>w</i> = 32.4 %), KTpCIPB ( <i>x<sub>i</sub></i> = 51 %), oNPOE ( <i>w</i> = 66.0 %)	Na <sup>+</sup> , -10.4; K <sup>+</sup> , -9.8; Ca <sup>2+</sup> , <-11.1	FIM	-	-	-	-		[9]
	<b>H<sup>+</sup>-2</b> ( <i>w</i> = 1.0 %), PVC ( <i>w</i> = 32.4 %), oNPOE ( <i>w</i> = 66.0 %), KTpCIPB ( <i>x<sub>i</sub></i> = 70 %)	Li <sup>+</sup> , <-10.8; Na <sup>+</sup> , -10.4; K <sup>+</sup> , -9.8; Ca <sup>2+</sup> , -11.1	-	-	-	57.4	10 <sup>-12</sup> -10 <sup>-5</sup>		[10]
	<b>H<sup>+</sup>-2</b> ( <i>w</i> = 1.5 %), DOS ( <i>w</i> = 8.0 %), KTpCIPB ( <i>x<sub>i</sub></i> = 49 %), aliphatic polyurethane ( <i>w</i> = 89.8 %)	Na <sup>+</sup> , -9.1; K <sup>+</sup> , -9.3; Ca <sup>2+</sup> , -9.1	FIM	-	Na <sup>+</sup> , 0.140; K <sup>+</sup> , 0.200; Ca <sup>2+</sup> , 0.100	58.6 ± 1.0	10 <sup>-6.5</sup> -10 <sup>-8.0</sup>	<i>c<sub>dl</sub></i> = 10 <sup>-10.0</sup> M; 22.0 ± 1.0 °C	[11]
	<b>H<sup>+</sup>-2</b> ( <i>w</i> = 1.5 %), DOS ( <i>w</i> = 8.0 %), KTpCIPB ( <i>x<sub>i</sub></i> = 49 %), aliphatic polyurethane ( <i>w</i> = 89.8 %), coated with poly(ethylene oxide)	Na <sup>+</sup> , -9.0; K <sup>+</sup> , -9.1; Ca <sup>2+</sup> , -9.1	FIM	-	Na <sup>+</sup> , 0.140; K <sup>+</sup> , 0.200; Ca <sup>2+</sup> , 0.100	55.8 ± 1.9	10 <sup>-6.5</sup> -10 <sup>-8.0</sup>	<i>c<sub>dl</sub></i> = 10 <sup>-9.9</sup> M; 22.0 ± 1.0 °C	[11]
	<b>H<sup>+</sup>-2</b> ( <i>w</i> = 1.5 %), DOS ( <i>w</i> = 8.0 %), KTpCIPB ( <i>x<sub>i</sub></i> = 49 %), aliphatic polyurethane ( <i>w</i> = 79.8 %), Pluronic F108 ( <i>w</i> = 10.0 %)	Na <sup>+</sup> , -8.5; K <sup>+</sup> , -8.6; Ca <sup>2+</sup> , -8.9	FIM	-	Na <sup>+</sup> , 0.140; K <sup>+</sup> , 0.200; Ca <sup>2+</sup> , 0.100	53.9 ± 0.7	10 <sup>-6.5</sup> -10 <sup>-8.0</sup>	<i>c<sub>dl</sub></i> = 10 <sup>-9.4</sup> M; 22.0 ± 1.0 °C	[11]
<b>H<sup>+</sup>-3</b>	<b>H<sup>+</sup>-3</b> ( <i>w</i> = 1.0 %), BEHS ( <i>w</i> = 65.6 %), PVC ( <i>w</i> = 32.8 %)	Na <sup>+</sup> , -10.1; K <sup>+</sup> , -9.6	FIM	-	1.0	58.0	10 <sup>-9.5</sup> -10 <sup>-4.5</sup>	25 °C	[3]
	<b>H<sup>+</sup>-3</b> ( <i>w</i> = 1.0 %), PVC ( <i>w</i> = 32.8 %), BEHS ( <i>w</i> = 65.6 %), NaTpCIPB ( <i>x<sub>i</sub></i> = 37 %)	Na <sup>+</sup> , -10.7; K <sup>+</sup> , -10.1	FIM	-	1.0	56.9	10 <sup>-10.0</sup> -10 <sup>-4.0</sup>	25 °C	[3]
	<b>H<sup>+</sup>-3</b> ( <i>w</i> = 1.0 %), PVC ( <i>w</i> = 32.8 %), BEHS ( <i>w</i> = 65.6 %), KTpCIPB ( <i>x<sub>i</sub></i> = 36 %)	Na <sup>+</sup> , -11.1; K <sup>+</sup> , -10.7	FIM	-	1.0	59.9	10 <sup>-11.0</sup> -10 <sup>-4.0</sup>	25 °C	[3]
<b>H<sup>+</sup>-4</b>	<b>H<sup>+</sup>-4</b> ( <i>w</i> = 1 %), PVC ( <i>w</i> = 30 %), KTpCIPB ( <i>x<sub>i</sub></i> = 70 %), oNPOE ( <i>w</i> = 69 %)	Li <sup>+</sup> , <-11.2; Na <sup>+</sup> , -10.5; K <sup>+</sup> , -9.4	FIM	-	Li <sup>+</sup> , 0.06; Na <sup>+</sup> , 0.14; K <sup>+</sup> , 0.20	-	-	20 °C; <i>lgP<sub>TLC</sub></i> = 13.8	[12]
<b>H<sup>+</sup>-5</b>	<b>H<sup>+</sup>-5</b> ( <i>w</i> = 1 %), PVC ( <i>w</i> = 30 %), KTpCIPB ( <i>x<sub>i</sub></i> = 70 %), oNPOE ( <i>w</i> = 69 %)	Li <sup>+</sup> , -6.9; Na <sup>+</sup> , -5.6;	FIM	-	-	-	-	20 °C; <i>lgP<sub>TLC</sub></i> = 15.2	[12]
	<b>H<sup>+</sup>-5</b> ( <i>w</i> = 1 %), oNPOE ( <i>w</i> = 68 %), PVC ( <i>w</i> = 30 %), KTpCIPB ( <i>x<sub>i</sub></i> = 76 %)	Li <sup>+</sup> , -6.9; Na <sup>+</sup> , -5.6; K <sup>+</sup> , -4.4	FIM	-	Li <sup>+</sup> , 0.06; Na <sup>+</sup> , 0.14; K <sup>+</sup> , 0.20	-	-	20 °C; microelec.	[13]
<b>H<sup>+</sup>-6</b>	<b>H<sup>+</sup>-6</b> ( <i>w</i> = 6 %), KTPB ( <i>x<sub>i</sub></i> = 29 %), oNPOE ( <i>w</i> = 54.9 %), PVC ( <i>w</i> = 36.1 %)	Na <sup>+</sup> , -8.55; K <sup>+</sup> , -8.40; Ca <sup>2+</sup> , -9.45	FIM	-	0.1	-	10 <sup>-8.5</sup> -10 <sup>-1.6</sup>	20 °C	[14]

**Table 1:** H<sup>+</sup>-Selective Electrodes (Continued)

ionophore	membrane composition	$\lg K_{H^+, B^{n+}}$	method	primary ion conc. (M)	interfering ion conc. (M)	slope (mV/decade)	linear range (M)	remarks	ref.
<b>H<sup>+</sup>-7</b>	<b>H<sup>+</sup>-7</b> ( <i>w</i> = 6 %), KTPB ( <i>x<sub>i</sub></i> = 37 %), oNPOE ( <i>w</i> = 54.9 %), PVC ( <i>w</i> = 36.1 %)	Na <sup>+</sup> , -8.50; K <sup>+</sup> , -8.25; Ca <sup>2+</sup> , -9.50	FIM	–	0.1	–	10 <sup>-8.5</sup> –10 <sup>-1.6</sup>	20 °C	[14]
<b>H<sup>+</sup>-8</b>	<b>H<sup>+</sup>-8</b> ( <i>w</i> = 6 %), KTPB ( <i>x<sub>i</sub></i> = 45 %), oNPOE ( <i>w</i> = 54.9 %), PVC ( <i>w</i> = 36.1 %)	Na <sup>+</sup> , -8.45; K <sup>+</sup> , -8.40; Ca <sup>2+</sup> , -9.45	FIM	–	0.1	–	10 <sup>-8.5</sup> –10 <sup>-1.6</sup>	20 °C	[14]
<b>H<sup>+</sup>-9</b>	<b>H<sup>+</sup>-9</b> ( <i>w</i> = 1.0 %), PVC ( <i>w</i> = 32.4 %), KTpCIPB ( <i>x<sub>i</sub></i> = 51 %), oNPOE ( <i>w</i> = 66.0 %)	Li <sup>+</sup> , <-10.8; Na <sup>+</sup> , -10.9; K <sup>+</sup> , -10.5; Ca <sup>2+</sup> , <-11.2	FIM	–	–	58.2	10 <sup>-12</sup> –10 <sup>-4</sup>	<i>t</i> <sub>resp</sub> < 10 s	[9]
	<b>H<sup>+</sup>-9</b> ( <i>w</i> = 1.0 %), PVC ( <i>w</i> = 32.4 %), oNPOE ( <i>w</i> = 66.0 %), KTpCIPB ( <i>x<sub>i</sub></i> = 70 %)	Li <sup>+</sup> , <-10.8; Na <sup>+</sup> , -10.9; K <sup>+</sup> , -10.5; Ca <sup>2+</sup> , <-11.2	–	–	–	58.2	10 <sup>-12</sup> –10 <sup>-4</sup>		[10]
	<b>H<sup>+</sup>-9</b> , PVC–NH <sub>2</sub> , oNPOE (weight ratio not reported)	Li <sup>+</sup> , <-10.9; Na <sup>+</sup> , -11.1; K <sup>+</sup> , -10.5; Ca <sup>2+</sup> , -11.2	FIM	–	Li <sup>+</sup> , 0.060; Na <sup>+</sup> , 0.140; K <sup>+</sup> , 0.200; Ca <sup>2+</sup> , 0.150	58.9	10 <sup>-4</sup> –10 <sup>-12</sup>	<i>c</i> <sub>dl</sub> < 10 <sup>-12</sup> M; 22.5 ± 0.5 °C	[15]
	<b>H<sup>+</sup>-9</b> ( <i>w</i> = 2 %), oNPOE ( <i>w</i> = 64.7 %), KTpCIPB ( <i>x<sub>i</sub></i> = 49 %), aliphatic polyurethane ( <i>w</i> = 32.3 %)	Li <sup>+</sup> , -10.7; Na <sup>+</sup> , -10.6; K <sup>+</sup> , -10.6	FIM	–	Li <sup>+</sup> , 0.060; Na <sup>+</sup> , 0.140; K <sup>+</sup> , 0.200	58.1	10 <sup>-4</sup> –10 <sup>-11</sup>	25.0 ± 0.5 °C	[16]
	<b>H<sup>+</sup>-9</b> ( <i>w</i> = 2 %), BEHS ( <i>w</i> = 64.7 %), KTpCIPB ( <i>x<sub>i</sub></i> = 49 %), aliphatic polyurethane ( <i>w</i> = 32.3 %)	Li <sup>+</sup> , -10.2; Na <sup>+</sup> , -10.4; K <sup>+</sup> , -10.4	FIM	–	Li <sup>+</sup> , 0.060; Na <sup>+</sup> , 0.140; K <sup>+</sup> , 0.200	57.8	10 <sup>-11</sup> –10 <sup>-4</sup>	25.0 ± 0.5 °C	[16]
<b>H<sup>+</sup>-10</b>	<b>H<sup>+</sup>-10</b> ( <i>w</i> = 1.0 %), KTpCIPB ( <i>x<sub>i</sub></i> = 51 %), oNPOE ( <i>w</i> = 66.0 %), PVC ( <i>w</i> = 32.4 %)	Li <sup>+</sup> , -9.3; Na <sup>+</sup> , -8.8; K <sup>+</sup> , -7.4; Ca <sup>2+</sup> , -9.9	FIM	–	–	59.1	10 <sup>-10.5</sup> –10 <sup>-2</sup>	<i>t</i> <sub>resp</sub> < 10 s	[9]
	<b>H<sup>+</sup>-10</b> ( <i>w</i> = 1.0 %), oNPOE ( <i>w</i> = 66.0 %), KTpCIPB ( <i>x<sub>i</sub></i> = 70 %), PVC ( <i>w</i> = 32.4 %)	Li <sup>+</sup> , -9.3; Na <sup>+</sup> , -8.8; K <sup>+</sup> , -7.4; Ca <sup>2+</sup> , -9.9	–	–	–	59.1	10 <sup>-10.5</sup> –10 <sup>-2</sup>		[10]
<b>H<sup>+</sup>-11</b>	<b>H<sup>+</sup>-11</b> ( <i>w</i> = 2.5 %), PVC ( <i>w</i> = 30 %), KTmCIPB ( <i>x<sub>i</sub></i> = 65 %), oNPOE ( <i>w</i> = 66.5 %)	Li <sup>+</sup> , <-12.4; Na <sup>+</sup> , -12.3; K <sup>+</sup> , -10.8; Ca <sup>2+</sup> , <-11.7	FIM	–	1.0	57.4	10 <sup>-13.2</sup> –10 <sup>-1.7</sup>	<i>τ</i> > 30 d	[17]
<b>H<sup>+</sup>-12</b>	<b>H<sup>+</sup>-12</b> ( <i>w</i> = 1.0 %), oNPOE ( <i>w</i> = 66.0 %), PVC ( <i>w</i> = 32.4 %), KTpCIPB ( <i>x<sub>i</sub></i> = 70 %)	Li <sup>+</sup> , <-10.8; Na <sup>+</sup> , <-11; K <sup>+</sup> , <-11; Ca <sup>2+</sup> , <-11.2	–	–	–	57.7	10 <sup>-12</sup> –10 <sup>-4</sup>		[10]

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**Table 1:** H<sup>+</sup>-Selective Electrodes (Continued)

ionophore	membrane composition	$\lg K_{H^+,B^{n+}}$	method	primary ion conc. (M)	interfering ion conc. (M)	slope (mV/decade)	linear range (M)	remarks	ref.
<b>H<sup>+</sup>-13</b>	<b>H<sup>+</sup>-13</b> (0.7M), KTPCIPB (0.001 M), PVC and DOP (1:3 by weight)	Li <sup>+</sup> , -5.3; Na <sup>+</sup> , -5.3; K <sup>+</sup> , -6.2; Cu <sup>2+</sup> , -5.0; NH <sub>4</sub> <sup>+</sup> , -4.7	SSM, MSM	–	–	–	10 <sup>-6</sup> – 1		[18]
<b>H<sup>+</sup>-14</b>	<b>H<sup>+</sup>-14</b> ( <i>w</i> = 2.5 %), PVC–COOH ( <i>w</i> = 32.5 %), oNPOE ( <i>w</i> = 65.0 %)	Li <sup>+</sup> , -1.77; Na <sup>+</sup> , -1.38; K <sup>+</sup> , -0.19; NH <sub>4</sub> <sup>+</sup> , -0.52; Ca <sup>2+</sup> , -1.36	SSM	0.1	0.1	59.2	–	22.5 ± 0.5 °C	[19]
<b>H<sup>+</sup>-15</b>	PVC–COOH ( <i>w</i> = 33.3 %), oNPOE ( <i>w</i> = 66.7 %)	Li <sup>+</sup> , -1.56; Na <sup>+</sup> , -1.32; K <sup>+</sup> , -1.13; NH <sub>4</sub> <sup>+</sup> , -1.13; Ca <sup>2+</sup> , -1.46	SSM	0.1	0.1	63.6	10 <sup>-5</sup> –10 <sup>-2</sup>	22.5 ± 0.5 °C	[19]
	PVC–COOH ( <i>w</i> = 33.3 %), BEHS ( <i>w</i> = 66.7 %)	Li <sup>+</sup> , -1.08; Na <sup>+</sup> , -0.79; K <sup>+</sup> , -0.33; NH <sub>4</sub> <sup>+</sup> , -0.46; Ca <sup>2+</sup> , -2.13	SSM	0.1	0.1	54.3	10 <sup>-5</sup> –10 <sup>-2</sup>	22.5 ± 0.5 °C	[19]
	TDABr ( <i>w</i> = 0.3 %), PVC–COOH ( <i>w</i> = 33.2 %), oNPOE ( <i>w</i> = 66.5 %)	Na <sup>+</sup> , -1.81; K <sup>+</sup> , -1.62; NH <sub>4</sub> <sup>+</sup> , -1.58	SSM	0.1	0.1	–	–	22.5 ± 0.5 °C	[19]
<b>H<sup>+</sup>-16</b>	<b>H<sup>+</sup>-16</b> ( <i>w</i> = 8.7 %), KTPCIPB ( <i>x</i> <sub>i</sub> = 12.0 %), oNPOE ( <i>w</i> = 36.1 %), CP ( <i>w</i> = 18.2 %), PVC ( <i>w</i> = 36.2 %)	Na <sup>+</sup> , -8.0; K <sup>+</sup> , -7.4 ; Ca <sup>2+</sup> , <-7.8	–	–	–	–	10 <sup>-10</sup> –10 <sup>-1</sup>	<i>t</i> <sub>resp</sub> < 10 s; <i>τ</i> > 135 d	[20]
<b>H<sup>+</sup>-17</b>	<b>H<sup>+</sup>-17</b> (9.6 mmol/kg), TDDMACl ( <i>x</i> <sub>i</sub> = 50 %), PVC and oNPOE (1:2 by weight)	K <sup>+</sup> , -8.3	FIM	–	0.77	58.5	10 <sup>-10</sup> –10 <sup>-3.5</sup>		[21]
	<b>H<sup>+</sup>-17</b> (9.6 mmol/kg), KTPCIPB ( <i>x</i> <sub>i</sub> = 50 %), PVC and oNPOE (1:2 by weight)	K <sup>+</sup> , -1.5	FIM	–	0.77	–	>10 <sup>-3</sup>		[21]
<b>H<sup>+</sup>-18</b>	aliphatic polyurethane ( <i>w</i> = 33.3 %), oNPOE ( <i>w</i> = 66.7 %)	Li <sup>+</sup> , -2.19; Na <sup>+</sup> , -2.08; K <sup>+</sup> , -1.95; NH <sub>4</sub> <sup>+</sup> , -2.04; Ca <sup>2+</sup> , -2.47	SSM	10 <sup>-3</sup>	10 <sup>-3</sup>	43.3	10 <sup>-5</sup> –10 <sup>-3</sup>	25.0 ± 0.5 °C	[16]

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