Novel CeO2-based Screen-Printed Potentiometric Electrodes for pH monitoring

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Tables

Table 1: Preparation of 1L of NH_4Cl /NH_3 and $NaHCO_3$/Na_2CO_3 buffer solutions.

Table 2: SPEs capacitive current obtained in NaCl 0.1 mol L^{-1}. Experimental conditions: CV between 0.1V/NHE and 1V/NHE. Scan rate: 0.05 V s^{-1}, 5 electrodes.

Table 3: $|\Delta E|$ (mV) as well as anodic and cathodic i_p (nA) measured by CV in NaCl 0.1 mol L^{-1} containing $FcTMA^+$ 2 10^{-3} mol L^{-1}. Experimental conditions: CV between 0.1V/NHE and 1V/NHE. Scan rate: 0.05 V s^{-1}, 5 electrodes.

Table 4: Results of the simulation of EIS measurements

Table 1

NH_4Cl/NH_3 buffer solutions					
		Volume (mL) of		Total equivalent activity of	
	pH	HCl (1 mol L^{-1})	NH_3 (1 mol L^{-1})	NH_4^+ (mol L^{-1})	NH_3 (mol L^{-1})
	7.2	50.0	50.7	$3.4\ 10^{-2}$	$3.0\ 10^{-4}$
	7.5	50.0	51.1	$3.4\ 10^{-2}$	$6.3\ 10^{-4}$
	7.6	50.0	50.3	$3.4\ 10^{-2}$	$8.0\ 10^{-4}$
	8.6	50.0	60.0	$3.4\ 10^{-2}$	$8.0\ 10^{-3}$
	9.3	50.0	97.0	$3.3\ 10^{-2}$	$3.8\ 10^{-2}$
	9.5	50.0	125.0	$3.3\ 10^{-2}$	$5.9\ 10^{-2}$
	9.7	50.0	170.0	$3.2\ 10^{-2}$	$9.2\ 10^{-2}$
	10.6	50.0	950.0	$2.2\ 10^{-2}$	$4.5\ 10^{-1}$
	10.8	30.0	970.0	$1.4\ 10^{-2}$	$4.7\ 10^{-1}$
$NaHCO_3/Na_2CO_3$ buffer solutions					
		Volume (mL) of		Total equivalent activity of	
IS*	pH	$NaHCO_3$ (1 mol L^{-1})	Na_2CO_3 (1 mol L^{-1})	HCO_3^- (mol L^{-1})	CO_3^{2-} (mol L^{-1})
0.05	8.6	53.0	22.0	$3.8\ 10^{-2}$	$1.2\ 10^{-3}$
	8.9	43.0	3.6	$3.1\ 10^{-2}$	$1.8\ 10^{-3}$
	9.7	21.8	9.4	$1.6\ 10^{-2}$	$4.7\ 10^{-3}$
0.10	9.6	45.3	18.2	$3.1\ 10^{-2}$	$8.3\ 10^{-3}$
	10.1	24.9	22.3	$1.8\ 10^{-2}$	$1.0\ 10^{-2}$
	10.6	7.1	30.8	$5.3\ 10^{-3}$	$1.4\ 10^{-2}$
0.20	9.3	115.7	28.2		
	10.1	36.1	54.6		
	10.4	19.3	60.1		
	10.6	12.3	62.4		
	11.8	3.9	64.9		

*IS: Ionic strength

Table 2

SPEs	**I_c (nA)**
C	36 ± 1
CeO_2	40 ± 2
$Ce_{0.8}Sm_{0.2}O_2$	260 ± 10
$Ce_{0.8}Zr_{0.2}O_2$	470 ± 20

Table 3

SPEs	**$|\Delta E|$ (mV)**	**i_{pa} (nA)**	**i_{pc} (nA)**
C	62 ± 2	195 ± 10	195 ± 10
CeO_2	63 ± 3	205 ± 10	205 ± 10
$Ce_{0.8}Sm_{0.2}O_2$	60 ± 3	205 ± 10	205 ± 10
$Ce_{0.8}Zr_{0.2}O_2$	60 ± 3	205 ± 10	205 ± 10

Table 4

		Component of the equivalent electrical circuit (EEC)					
SPEs	**EE Circuit**	**R_e (ohm)**	**C_d (µF)/cm²**	**R_t (ohm)**	**Q-Yo (x10^6)**	**Q-n**	**χ^2**
CeO_2	R(C(RQ))	0.0	1.89	1587.0	0.556	0.927	0.0188
CeO_2	R(CR)Q	0.0	1.89	1583.0	0.556	0.927	0.0187
$Ce_{0.8}Sm_{0.2}O_2$	R(C(RQ))	0.0	0.63	5395.0	6.397	0.923	0.0073
$Ce_{0.8}Sm_{0.2}O_2$	R(CR)Q	0.0	0.63	5395.0	6.397	0.923	0.0073
$Ce_{0.8}Zr_{0.2}O_2$	R(C(RQ))	0.0	0.31	19140.0	3.169	0.944	0.0088
$Ce_{0.8}Zr_{0.2}O_2$	R(CR)Q	0.0	0.31	19140.0	3.169	0.944	0.0088
C	R(C(RQ))	0.0	1.20	2316.0	0.487	0.920	0.0101
C	R(CR)Q	0.0	1.20	2313.0	0.488	0.920	0.0101