Nomenclature

English Symbols

A	—	parameter;
a_B	[1]	activity of dissolved component B;
a_0	[1]	value of the limit of detection;
$\mathfrak{a}_{\mathrm{B}j}$	$= a_j^{z_\mathrm{B}/z_j}$	transformed activity;
b, B	—	parameters;
c°	$= 1\,{}^{\mathrm{mol}}/_{\mathrm{L}}$	standard molarity;
c_B	$[\mathrm{mol\,L^{-1}}]$	molarity of dissolved component B;
$\mathfrak{c}$	—	sensitivity coefficient;
d	[m]	membrane thickness;
D	$[\mathrm{m^2\,s^{-1}}]$	diffusion coefficient;
E	[V]	cell potential (emf);
$E^{(\mathrm{NE})}$	[V]	cell potential calculated using the NE model;
$E^{(\mathrm{PBP})}$	[V]	cell potential calculated using the PBP model;
E^0	[V]	cell constant;
E^0_Ref	[V]	standard potential of electrode;
E_Bound	[V]	interfacial potential difference;
E_D	[V]	diffusion potential;
E_LJ	[V]	liquid-junction potential;
E_M	[V]	membrane potential on the ISE;
$\mathcal{E}$	$[\mathrm{V m^{-1}}]$	electric field;
F	$= 9.648\,45 \cdot 10^4\,{}^{\mathrm{C}}/_{\mathrm{mol}}$	Faraday equivalent;
$f()$, $F()$	—	functions;
I_c	$[\mathrm{mol\,L^{-1}}]$	ionic strength based on molarity;
I_m	$[\mathrm{mol\,kg^{-1}}]$	ionic strength based on molality;
J_i	$[\mathrm{m^{-2}\,s^{-1}}]$	flux of ith ion;
k_B	[1]	distribution constant;
$\mathfrak{k}$	[1]	coverage factor;
K	[1]	thermodynamic selectivity coefficient;
K^Pot	[1]	potentiometric selectivity coefficient;
$K_{i\mathrm{T}}$	[1]	total distribution coefficient;
K_T	[1]	total concentration of anionic sites in a membrane;
m°	$= 1\,{}^{\mathrm{mol}}/_{\mathrm{kg}}$	standard molality;
m_B	$[\mathrm{mol\,kg^{-1}}]$	molality of dissolved component B
$\boldsymbol{m}$	[1]	number of measuring points;
M_B	[kg/mol]	molar mass of component B
n	[1]	number of statically independent observations;
$\boldsymbol{n}$	[1]	number of ions in the solution;
N	$[\mathrm{mol\,L^{-1}}]$	normality;
$\mathcal{N}$	[1]	total number of elements in population;
$\mathcal{N}$	[1]	mole fraction;
lg	$= \log_{10}$	common logarithm — logarithm to the base 10;
ln	$= \log_e$	natural logarithm — logarithm to the base e;

n_{B}	[1]	amount-of-substance B;
p	[1]	level of confidence (coverage probability);
$\boldsymbol{p}$	[1]	number of ISEs;
p, P	—	variable;
$\boldsymbol{P}$	[1]	purity;
ppm	—	parts per million;
pH	$= -\lg a_{\mathrm{H}}$ [1]	concentration measure of hydrogen ions;
pX	$= -\lg a_{\mathrm{X}}$ [1]	concentration measure of ions other then hydrogen ones;
q, Q, r	—	variables;
$\mathbf{r}$	[m]	position;
R	$= 8.314\,32\ {}^{\mathrm{J}}/_{\mathrm{K\,mol}}$	gas constant;
s	$= {}^{RT}/_{\mathrm{F}}$	parameter in Eq. (18);
$\boldsymbol{s}$	—	estimate of parameter σ, experimental standard deviation;
$\boldsymbol{s}^2$	—	experimental variance;
S_{B}	[V]	Nernstian slope;
$S_{\mathrm{B}}^{(e)}$	$= {}^{S_{\mathrm{B}}}/_{2.303}$	a factor, corresponding to the Nernstian slope, in means of definition using the natural logarithm;
t_i		transfer number of ion i;
t	[1]	time;
T	[K]	absolute temperature;
u_i	$[\mathrm{m^2\,V^{-1}\,s^{-1}}]$	mobility of ith ion;
$\boldsymbol{u}$	—	standard uncertainty;
$\mathcal{U}$	—	expanded uncertainty;
v	$[\mathrm{m\,s^{-1}}]$	flow velocity;
V	$[\mathrm{m^3}]$	total volume of solution;
$\boldsymbol{w}$	—	relative uncertainty;
w	[1]	weight coefficient;
x, X	—	variable;
y, Y	—	variable;
z_{B}	[1]	charge number of ion B (positive or negative number).

Greek Symbols

α	[1]	ratio of free to total species concentration;
γ	[1]	molal activity coefficient;
$\gamma_{\pm}$	[1]	mean activity coefficient;
γ^c	[1]	molar activity coefficient;
$\gamma^{\mathcal{N}}$	[1]	fractional activity coefficient;
Δx	—	error of measurement of quantity x;
ε	$[\mathrm{F\,m^{-1}} = \mathrm{kg^{-1}m^{-3}s^4A^2}]$	dielectric constant (permittivity);
ε_0	$= 8.8541\ {}^{\mathrm{F}}/_{\mathrm{m}}$	permittivity of free-space;
$\boldsymbol{\mu}_i$	$[\mathrm{J\,mol^{-1}}]$	chemical potential;
$\boldsymbol{\mu}^{\mathrm{o}}$	$[\mathrm{J\,mol^{-1}}]$	standard chemical potential;
$\tilde{\boldsymbol{\mu}}_i$	$[\mathrm{J\,mol^{-1}}]$	electrochemical potential;
μ	—	mean (result from an infinite number of measurements);
ν	[1]	stoichiometry number;
ϱ	$[\mathrm{kg\,m^{-3}}]$	density of solution;
ρ	$[\mathrm{C\,m^{-3}}]$	charge density;
σ	—	standard deviation;
σ^2	—	variance;
$\phi()$	[V]	average electrostatic potential;
ϕ	[m]	mean effective diameter of the hydrated ions;

Φ	[1]	dimensionless electrical potential function.

Sub- and Superscripts

$\square'$, $\square''$	at the membrane in the bulk and in the inner solution;
$\bar{\square}$	arithmetic mean;
$\tilde{\square}$	median;
$\square(0)$, $\square(d)$	in the membrane at the bulk and at the inner solution;
$\square_+$, $\square_-$	cations and anions;
$\square^\star$	for a pure solution;
$\square^\text{❖}$	for a mixture;
$\square^\diamond$	arising from other components;
$\square_a$	anion;
$\square_c$	cation;
$\square_\text{c}$	combined;
$\square_i$, $\square_j$	indexes;
$\square_{i_1}$ $\square_{i_2}$ $\square_{i_3}$	uni-, di- and trivalent species;
$\square_M$	cation of interest;
$\square_n$	neutral molecule;
$\square_X$	anion of interest;
$\square_r$	relative.

Acronyms and Abbreviations

ANN	artificial neural network
DH	Debye–Hückel
emf	electromotive force
GUM	Guide to the Expression of Uncertainty in Measurement
ISE	ion-selective electrode
ISO	International Organization for Standardization
IUPAC	International Union of Pure and Applied Chemistry
LOD	limit of detection
MSA	mean spherical approximation
NE	Nikolsky–Eisenman
PBP	phase-boundary potential
PVC	polyvinyl chloride
SHE	standard hydrogen electrode
VIM	International Vocabulary of Basic and General Terms in Metrology

Definitions

measuring point – a set of activities and corresponding to them potential of the ISE (p. 65).

stretch factor – a number by which spans of randomized ISE's parameters are multiplied before starting simulations while the arrangement of measuring points keep the same (p. 73).