9. Symbols and terminology
9.1. General

It is strongly preferred that authors follow the recommendations of the IUPAC Manual of Symbols and Terminology for Physico-chemical Quantities and Units, edited by I.M. Mills, Blackwells, Oxford, 1988. Some examples of recommended usage are given here (see also J. Electroanal. Chem., 271 (1989) 371–379).

If Authors depart from these recommendations, articles may be returned for correction or corrected in the editorial office. In the latter case, no responsibility for errors can be assumed.

S.I. units should be used. ‘Equivalents’ and ‘Normalities’ should not be used. Meaningless units (e.g. e.u.) should be avoided.

Concentration should be denoted by the chemical formula in square brackets, or by lower case c. Units of concentration should be given as mol dm^{-3}, mol cm^{-3}, M, mol l^{-1}, etc.

Mixtures should be indicated by a plus sign, e.g. Zn + Cu, H2O + CH3OH etc. Interfaces should be indicated by a vertical bar (see equations (1) and (2) below). The function *G* should be called Gibbs energy, not Gibbs free energy or free enthalpy.

Some terms of historical interest only should be avoided, e.g. depolarizer, polarization (of electrodes).

9.2. Mathematical formulae

Subscripts and superscripts should be set o. clearly. Special care should be taken that subscripts and superscripts are legible. Greek letters and handwritten symbols should be explained in the margin where they are first used. Special care should be taken to show clearly the difference between zero (0) and the letter O, and between one (1) and the letter *l*.

The meaning of all symbols should be given immediately after the equation in which they are first used, or a list of definitions provided. Abbreviations not in common use should be defined.

For fractions, especially in the text, space can be saved by using the solidus (/) or by using negative exponents instead of a horizontal line,

e.g $I_p/2m$ or $I_p(2m)^{-1}$ *rather than* $_p2Im$

If necessary, parentheses can be used to avoid ambiguity.

All equations (mathematical and chemical) should be numbered sequentially in parentheses at the right-hand margin. They should be treated as part of the text.

The use of fractional powers instead of root signs is recommended. Complicated powers of e are often more conveniently denoted by exp(...). Natural or Napierian logarithms should be denoted by ln, whereas decadic logarithms should be denoted by log.

The multiplication sign should be used in floating point numbers to avoid confusion, e.g. 4.25×10^5. The decimal point should always be denoted by a full stop.

9.3. Chemical formulae and nomenclature

Nomenclature should follow IUPAC recommendations (see http://www.iupac.org). For inorganic chemistry, see: Nomenclature of Inorganic Chemistry, Blackwell Scientific Publications, 1990. For organic chemistry, see: Nomenclature of Organic Chemistry, Pergamon Press, 1979.

Structural formulae should be numbered with Roman numerals: they should be submitted on separate sheets in a form suitable for direct reproduction. Drawn structural formulae should use upright lettering.

9.4. Electrochemical conventions

Cells should be written in the form
$_{2}$HCu(s)|Pt(s)|(g)|(aq)|AgCl(s)|Ag(s)|Cu(s)HCl$_{cp}$
$_{||44||12}$Cu(s)|CuSOaq)ZnSOaq)|Zn(s)|Cu(s)(($_{cc}$ (2)
A single vertical bar represents a phase boundary, a dashed vertical bar represents a junction between miscible liquids and a double dashed vertical bar represents a liquid junction in which the liquid junction potential is assumed to have been eliminated.

The electric potential difference E of a cell such as (1) or (2) is given the sign of the terminal written on the right-hand side. Thus for cell (1) when reactants are in their standard states E_{10} = 0:2223 V at 25 °C, and for cell (2) E_{20} = −1:000 V.

The cell reaction is then written so that when it occurs from left to right, electrons would flow from the lefthand electrode to the right-hand electrode through a wire joining them: for cells (1) and (2), respectively,

$_{2+-}$1H(g)+AgCl(s)Ag(s)+H(aq)+Cl(aq)2⟶ (1)

$_{22+}$Cu(s)+Zn(aq)Cu(aq)+Zn(s)$_{+}$⟶ (2)

The standard potential of an electrode reaction in a protic solvent is the standard potential of a cell reaction in which molecular hydrogen is oxidized to solvated protons. It is thus related to a cell in which the left-hand electrode is a hydrogen electrode, e.g. E_{10} above.

Similar conventions should be used when cells passing current are being described. Thus, it is usually most convenient to write the test (working) electrode on the right and the reference electrode on the left. **Anodic current should be taken as positive, cathodic current as negative.**

In plotting current–potential curves, the current should be plotted on the y axis (ordinate) and the potential on the x axis (abscissa). The current and potential should preferably be positive in the upper right-hand quadrant, although negative currents and potentials in this quadrant are also acceptable. In any case, cyclic voltammograms should be drawn 'clockwise'. They should be provided with axes in the same way as for other current–potential plots. Usage should be consistent throughout a paper.
The empirical transfer coefficient is defined as

$\alpha_c = -(RT/nF)(\partial \ln|I_c|\partial E)_{T,p,c}$
for a cathodic process and
$\alpha_a = -(RT/nF)(\partial \ln|I_c|\partial E)_{T,p,c}$
for an anodic process, where n is the number of electrons transferred in the cell reaction as formulated (charge number of the cell reaction) and I_c and I_a are the partial cathodic and anodic kinetic currents, i.e. the currents which would flow if mass transport were infinitely fast.

9.5. List of symbols and abbreviations

In general, italic symbols are used for physical quantities, while roman symbols are used for units, names of phenomena and labels. The following symbols and abbreviations are strongly recommended. Of course the list is far from complete.

α activity
A ampere
A area; affinity; absorbance alternating current
(aq) in aqueous solution
c concentration
C capacitance
cd current density
CPE carbon paste electrode
cpm counts per minute
CV cyclic voltammetry
d layer thickness; relative density
D diffusion coefficient
dc direct current
DME dropping mercury electrode
DMF dimethyl formamide differential pulse polarography
e electron
e magnitude of the electronic charge
E electric potential of a galvanic cell or of an electrode*
E electric field strength
ecm electrocapillary maximum
eV electron volt
F Farad
F Faraday constant; Helmholtz energy
g gram
G Gibbs energy
GCE glassy carbon electrode
XVI
h hour
h Planck's constant
H enthalpy
HMDE hanging mercury drop electrode
Hz Hertz
I current; ionic strength
j imaginary unit
j current density
J joule
J flux
k Boltzmann's constant; rate constant
K Kelvin (thermodynamic (absolute) temperature degree)
K equilibrium constant
LSV linear sweep voltammetry
m mass; molality (mol kg^{-1} of solvent)
M concentration (mol^{-1})
min minute
n number of moles; charge number of cell (electrode) reaction

N_A Avogadro's constant
NPP normal pulse polarography
p pressure
P permeability; probability
PGE pyrolytic graphite electrode
ppm(b) parts per million (billion)
pzc potential of zero charge
Q quantity of electricity (electric charge)
R gas constant; resistance
RDE rotating disk electrode
RHE reversible hydrogen electrode, i.e. in equilibrium with the protons in the working solution
s second
S siemens
S entropy; solubility
SCE saturated calomel electrode
SHE standard hydrogen electrode
t time; transference number
T tesla
T thermodynamic temperature
U internal energy*
v potential scan rate; velocity
V volt
V volume
W watt
x mole fraction
XPS X-ray photoelectron spectroscopy
z charge number of an ion
Z impedance
α transfer coefficient** degree of dissociation
γ activity coefficient; surface or interfacial tension
Γ surface concentration (excess)
Δφ Galvani potential difference
Δψ Volta potential difference
ε permittivity; molar absorption coefficient
A/Il ξ electrokinetic potential
η overpotential; viscosity
θ fractional coverage
κ conductivity (specific conductance) Debye --Huckel reciprocal length
λ ionic conductivity; wavelength
Λ molar conductivity of an electrolyte; molar conductance
μ chemical potential
μ% electrochemical potential
ν frequency; stoichiometric reaction coefficient
π osmotic pressure
σ surface charge density
τ transition time; relaxation time; drop time

φ inner electric potential of a phase
χ surface electric potential
ψ outer electric potential of a phase; potential in general
Ω ohm

* In view of usage in semiconductor electrochemistry, it is acceptable to use *E* for electronic energy and *U* for electrode potential in this context.
** An unsubscripted α should be used only for a cathodic transfer coefficient. Electrode reaction rate constants calculated at the potential of an arbitrary reference electrode should be avoided.

The Faraday constant should not be used as a unit or as a synonym for ‘a mole of electrons’. The terms anodic and cathodic should not be used as synonyms for positive and negative potentials. They refer to processes.