Ion-Selective Electrode Interference (Nikolsky–Eisenman)

Primary ion activity from an ion-selective electrode reading with the Nikolsky–Eisenman correction for an interfering ion, and the error if it is ignored.

Method: Nikolsky–Eisenman equation

Input parameters

Unit system: SI

Parameter	Value	Unit
Measured potential	118.00	mV
Electrode intercept (from calibration)	295.00	mV
Charge of the primary ion	1.0000	
Charge of the interfering ion	1.0000	
Selectivity coefficient	0.010000	
Interfering ion activity (mol/L)	0.050000	
Temperature	25.000	°C

Calculated results

Parameter	Value	Unit
Nernst slope per decade	59.159	mV
Apparent activity (no correction, mol/L)	0.001019	
Primary ion activity (mol/L)	5.1878e-04	
Error if interference ignored	96.380	%

Notes for this case

• Nikolsky–Eisenman: E = E⁰ + (2.303RT/z_iF)·log(a_i + K_ij·a_j^{z_i/z_j}). The electrode sees the interfering ion as K_ij times as much primary ion; with K_ij from the maker or a separate-solution test, the true activity is the apparent one minus K_ij·a_j^{z_i/z_j}. Activities, not concentrations: use an ionic-strength adjustment buffer so the activity coefficient is constant. Slope 59.16 mV/decade at 25 °C for z = 1 (negative for anions).

Formula and method

$$E = E^0 + \frac{2.303RT}{z_i F}\log\left(a_i + K_{ij}a_j^{z_i/z_j}\right)$$

Variables

E	Measured potential	V
E^0	Electrode intercept (from calibration)	V
z_i	Charge of the primary ion	-
z_j	Charge of the interfering ion	-
K_{ij}	Selectivity coefficient	-
a_j	Interfering ion activity (mol/L)	-
T	Temperature	K
S	Nernst slope per decade	V
a_{app}	Apparent activity (no correction, mol/L)	-
a_i	Primary ion activity (mol/L)	-
$a_{app}/a_i - 1$	Error if interference ignored	-

Method and standards

ISE interference.

Assumptions and limits

- Nernstian electrode; fixed ionic strength; known selectivity coefficient.

References

Nikolsky–Eisenman equation

Report details

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Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/instrumentation/analysers/ion-selective-electrode-nikolsky

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Reopens the calculator with the inputs of this report.