Galvanic Cell Potential from the Nernst Equation

Open-circuit potential of a galvanic couple of two metals in their ion solutions from standard potentials and ion activities by the Nernst equation, with ΔG.

Method: Nernst equation

Input parameters

Unit system: SI

Parameter	Value	Unit
Standard potential of the anode metal	-0.76300	V
Standard potential of the cathode metal	0.34200	V
Electrons transferred	2.0000	
Anode ion activity	0.10000	
Cathode ion activity	0.010000	
Temperature	25.000	°C

Calculated results

Parameter	Value	Unit
Standard cell potential	1.1050	V
Nernst concentration term	-29.580	mV
Cell potential	1.0754	V
Free energy change per mol of reaction	-207.52	kJ/mol

Notes for this case

• E = E°_c − E°_a − (RT/nF)ln(a_a/a_c) for M_a + M_c^n+ → M_a^n+ + M_c. Positive E means the anode metal corrodes spontaneously. In real waters the galvanic series (measured in that environment) and the area ratio matter more than standard potentials.

Formula and method

$$E = E_c^\circ - E_a^\circ - \frac{RT}{nF}\ln\frac{a_a}{a_c}, \quad \Delta G = -nFE$$

Variables

E_a°	Standard potential of the anode metal	V
E_c°	Standard potential of the cathode metal	V
n	Electrons transferred	-
a_a	Anode ion activity	-
a_c	Cathode ion activity	-
T	Temperature	K
E°	Standard cell potential	V
ΔE_N	Nernst concentration term	V
E	Cell potential	V
ΔG	Free energy change per mol of reaction	J/mol

Method and standards

Cell potential.

Assumptions and limits

- Ideal electrodes; activities known; no junction potential.

References

Nernst 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/materials/corrosion/galvanic-cell-potential

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.