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E–pH diagram → *Pourbaix diagram*

Eadie–Hofstee plot → *Michaelis–Menten kinetics*

Eastman's entropy → *heat of transport*

Earth cell — This was a → *battery* consisting of a copper and zinc electrode immersed in soil. It was used to produce electricity for telegraphing. See also → *Daniell cell*, → *zinc*, → Zn^{2+}/Zn electrodes, → $Zn^{2+}/Zn(Hg)$ electrodes, → *zinc–air batteries (cell)*, and → *Leclanché cell*.

Ref.: [i] Hauck WP (1883) *Die Galvanischen Batterien, Accumulatoren und Thermosäulen*, 2nd edn. Hartleben's Verlag, Wien

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Earthing — is the fastening of electrical equipment to earth to make the earth a part of an electrical circuit (→ *grounding*), i.e., the mounting of a low-resistance electrically conducting connection between electrical apparatus, on one side, and the earth, on the other. The specific electrical resistivity of (wet) earth is about 100 Ω m [i]. Earthing is primarily done for the protection against lightning strikes and electrostatic discharges (ESD), via influence or induction, but also to eliminate electric fields within a volume and to avoid noise in communication engineering devices. In the latter-mentioned broader meaning, this includes all measures to prevent the pick-up or transmission of stray electrical signals. See for the latter → *shielding*.

Ref.: [i] Westphal WH (ed) (1952) *Physikalisches Wörterbuch*. Springer, Berlin, p 367

MHer

Ebner cell — This was a → *battery* consisting of a platinized lead plate and a bottom electrode of a mercury pool with pieces of zinc. The electrolyte is dilute sulfuric acid. See also → *Tyer battery*, → *Daniell cell*, → *zinc*, → Zn^{2+}/Zn electrodes, → $Zn^{2+}/Zn(Hg)$ electrodes, → *zinc–air batteries (cell)*, and → *Leclanché cell*.

Ref.: [i] Hauck WP (1883) *Die Galvanischen Batterien, Accumulatoren und Thermosäulen*, 2nd edn. Hartleben's Verlag, Wien

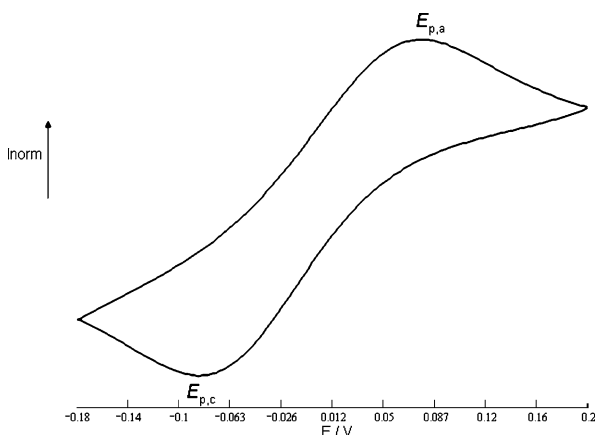
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E_{irrev} diagnostics in cyclic voltammetry — For electrochemical systems with kinetic constraints in the heterogeneous electron transfer reaction (→ *irreversibility*)

the following diagnostic criteria can be used in → *cyclic voltammetry* [i–iii]:

- for reduction processes: $I_{p,Red}/I_{p,Ox} < 1$;
- the half-wave peak potential ($\Delta E_{p/2}$) shifts for 30 mV/ αn in negative direction (for reduction processes), per decade increase of the scan rate (α is the → *transfer coefficient*);
- the peak currents are proportional to the square-root of the scan rate $\nu^{0.5}$ (by redox reactions controlled by diffusion);
- the potential separation between the cathodic and anodic peak $\Delta E_p = |E_{p,c} - E_{p,a}| > 57/n$ mV at 25 °C (see Fig. 1 below) and it increases by increasing the scan rate.

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E_{irrev} diagnostics in cyclic voltammetry — Figure 1. Simulated cyclic voltammogram for an E_{irrev} reaction

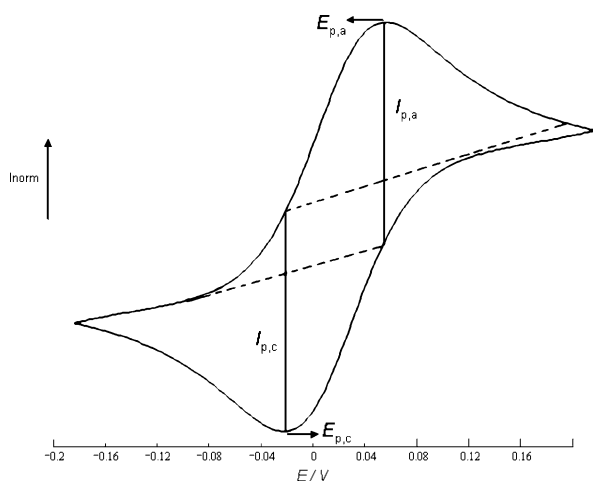
Refs.: [i] Nicholson RS, Shain I (1964) *Anal Chem* 36:706; [ii] Marken F, Neudeck A, Bond AM (2001) *Cyclic voltammetry*. In: Scholz F (ed) *Electroanalytical methods*. Springer, Berlin, pp 50–97; [iii] Bard AJ, Faulkner LR (2001) *Electrochemical methods*. 2nd edn. Wiley, New York, pp 226–260

RG

E_{rev} diagnostics in cyclic voltammetry — For an electrochemically reversible reaction (controlled by diffusion) of the type $O + ne^- \rightleftharpoons R$ (see → *reversibility*), the diagnostic criteria are as follows in → *cyclic voltammetry* [i, ii]:

- I_p (for both, reduction and oxidation) is a linear function of the square-root of the scan rate $\nu^{0.5}$;
- the ratio $I_{p,Red}/I_{p,Ox} = 1$ for wide range of scan rates;

- the half-wave peak potential ($\Delta E_{p/2}$) does not change by altering the scan rate;
- the potential separation between the cathodic and anodic peak $\Delta E_p = |E_{p,c} - E_{p,a}|$ is $57/n$ mV at 25 °C (see Fig. 2 below) [i–iii];



E_{rev} diagnostics in cyclic voltammetry — Figure 2. Simulated cyclic voltammogram for E_{rev} reaction

Refs.: [i] Nicholson RS, Shain I (1964) *Anal Chem* 36:706; [ii] Marken F, Neudeck A, Bond AM (2001) *Cyclic voltammetry*. In: Scholz F (ed) *Electroanalytical methods*. Springer, Berlin, pp 50–97; [iii] Bard AJ, Faulkner LR (2001) *Electrochemical methods*. 2nd edn. Wiley, New York, pp 226–260

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Ebonex electrodes — When TiO_2 is placed into an atmosphere of hydrogen at a temperature higher than 1000 °C partial reduction and formation of TiO_{2-x} phases occurs. Of particular interest is Ti_4O_7 , a black ceramic material of high electrical conductivity and chemical inertness. This material, Ebonex, has been formed into ceramic electrodes for applications as → *dimensionally stable anode* [ii] or → *cathode* [iii].

Refs.: [i] Hayfield PCS (2002) *Development of a new material: Monolithic Ti_4O_7 ebonex ceramic*. The Royal Society of Chemistry, London; [ii] Graves JE, Pletcher D, Clarke RL, Walsh FC (1992) *J Appl Electrochem* 22:200; [iii] Chen G, Betterton EA, Arnold RG, Ela WP (2003) *J Appl Electrochem* 33:161

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EC process — This is a case where the product (R) of an electrochemical reaction (E) reacts (e.g., with the solvent) to produce a species that is not electroactive at po-

tentials where the redox process of the electroactive couple occurs [i–iii]:

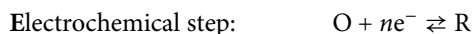


The oxidation of ascorbic acid, followed by hydration of the product is one representative example for this type of reactions [i] and subsequent chemical reactions in electrochemistry.

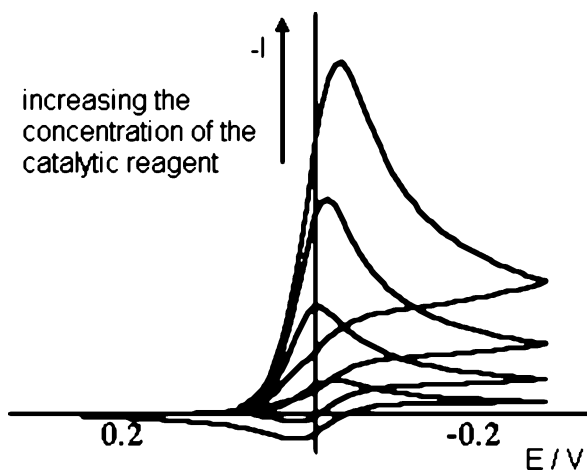
Refs.: [i] Nicholson RS, Shain I (1964) *Anal Chem* 36:706; [ii] Marken F, Neudeck A, Bond AM (2001) *Cyclic voltammetry*. In: Scholz F (ed) *Electroanalytical methods*. Springer, Berlin, pp 50–97; [iii] Bard AJ, Faulkner L (2001) *Electrochemical methods*. 2nd edn. Wiley, New York, pp 471–533

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EC' process — This is a special type of follow-up reaction of the product (R) of the electrochemical step with some nonelectroactive species (Z) in solution, to regenerate initial electroactive substrate, O. i.e.:



If the concentration of Z is much larger than that of O, the chemical reaction is pseudofirst order. The reduction of Ti(IV) in the presence of oxalate and hydroxylamine follows this pattern of catalytic chemical reactions in electrochemistry (→ *catalytic currents*). The typical features of the EC' reactions (under conditions of cyclic voltammetry) are reflected in increasing cathodic



EC' process — Figure. Influence of the concentration of the catalytic reagent Z to the current components of the cyclic voltammograms by an EC' reaction