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current efficiency

Also contains definition of: metal distribution

If several reactions take place simultaneously at the electrode a partial electrode current density (c.d.) j_k can be assigned to each reaction. It is given by the stoichiometry of the reaction and by the amount of substance of **B** reacting (per unit time and per unit electrode area) in the reaction considered. The current efficiency of reaction k, ε_k is defined as the ratio of j_k to the total c.d.:

$$\varepsilon_k = \frac{j_k}{\sum_m j_m}$$

Note that ε_k may be larger than one if cathodic and anodic reactions take place simultaneously at the same electrode. However, ε_k still gives correctly the product yield, which is the quantity of industrial interest. The product yield is the amount of substance of **B** produced per unit charge and is equal to $\frac{\varepsilon_k \nu_{B,k}}{n_k F}$ (in the absence of a chemical reaction which is consecutive to the electrode reaction and which consumes or produces species B). n_k is the charge number of electrode reaction k. Note that in the case of simultaneous electrode reactions the distribution of the partial c.d. j_k may be different from that of the total c.d., i.e. the function $\frac{(j_k)_x}{j} = f_k(x)$ may be different from $\frac{j_x}{j} = f(x)$. In electroplating the term 'metal distribution' is sometimes used to designate the distribution $f_k(x)$ of the partial c.d. for metal deposition.

Source:
PAC, 1981, *53*, 1827 *(Nomenclature for transport phenomena in electrolytic systems)* on page 1836

