current efficiency

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.:

$$\varepsilon_k = j_k / \sum_m j_m$$

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 $\varepsilon_k \nu_{B,k}/n_k F$ (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 $(j_k)_x/j = f_k(x)$ may be different from $j_x/j = f(x)$. In electroplating the term 'metal distribution' is sometimes used to designate the distribution $f_k(x)$ of the partial c.d. for metal deposition.

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