

ion-selective electrode (ISE)

An electrochemical sensor, based on thin films or selective membranes as recognition elements, and an electrochemical half-cell equivalent to other half-cells of the zeroth (inert metal in a redox electrolyte), 1st, 2nd and 3rd kinds. These devices are distinct from systems that involve redox reactions (electrodes of zeroth, 1st, 2nd and 3rd kinds), although they often contain a 2nd kind electrode as the 'inner' or 'internal' reference electrode. The potential difference response has, as its principal component, the Gibbs energy change associated with permselective mass transfer (by ion-exchange, solvent extraction or some other mechanism) across a phase boundary. The ion-selective electrode must be used in conjunction with a reference electrode (i.e. 'outer' or 'external' reference electrode) to form a complete electrochemical cell. The measured potential differences (ion-selective electrode vs. outer reference electrode potentials) are linearly dependent on the logarithm of the activity of a given ion in solution.

Comment: The term 'ion-specific electrode' is not recommended. The term 'specific' implies that the electrode does not respond to additional ions. Since no electrode is truly specific for one ion, the term 'ion-selective' is recommended as more appropriate. 'Selective ion-sensitive electrode' is a little-used term to describe an ion-selective electrode. 'Principal' or 'primary' ions are those which an electrode is designed to measure. It is never certain that the 'principal' ion is most sensitively measured, e.g. nitrate ion-selective electrodes.

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