

Glass electrode

The oldest and still most widespread ion-selective electrode that is used to measure pH, is the glass electrode. As a rule, it is constructed in one body directly with a suitable reference electrode. There are a number of modifications; here we will show the principle on the basic design.

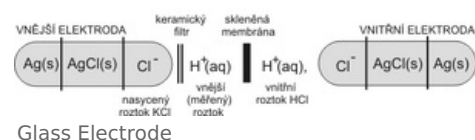
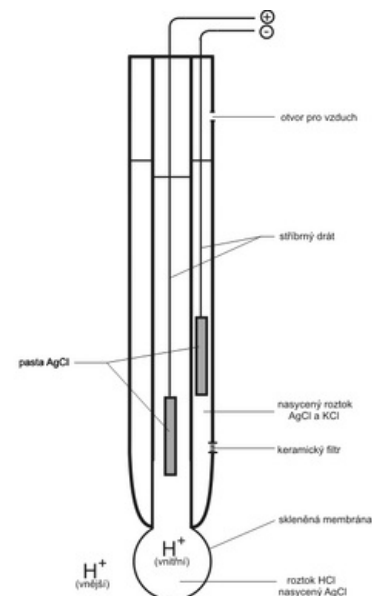
The ability of the glass electrode to indicate the concentration of H^+ can be simply explained by the fact that the glass membrane (a well with very thin walls blown from special glass) is permeable to H^+ and impermeable to other ions. A silver wire covered with a layer of AgCl is immersed in the internal electrolyte. Depending on the acidity of the measured solution, the concentration of H^+ inside the flask changes. Cl^- ions do not pass through the membrane, so in order to maintain the electroneutrality of the solution, the reaction takes place at the electrode



If we immerse the electrode in an acidic solution, the excess of H^+ ions will cause more Cl^- ions to be released from the AgCl paste. This consumes more electrons from the silver wire and the electrode gets a more positive voltage compared to the reference. Conversely, in an alkaline environment, excess Cl^- will donate its electrons and the electrode will have a more negative voltage.

A silver wire coated with AgCl paste is most often used as a reference electrode in pH-meter, but this time it is immersed in a KCl solution with a precise concentration (i.e. in a solution with a constant concentration of Cl^- , e.g. saturated, $1 \text{ mol}\cdot\text{l}^{-1}$, $3 \text{ mol}\cdot\text{l}^{-1}$ etc.). The potential of the reference electrode is not affected by the concentration of H^+ ions. The electrolyte of the reference electrode is conductively connected to the measured solution by means of a bridge with a ceramic partition (frit).

The given description of the pH-metric electrode is greatly simplified. The actual steps on the glass membrane are described in the glass electrodes details.



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