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6.2323.000 Storage solution

for pH glass electrodes with KCl 3 mol/L as electrolyte

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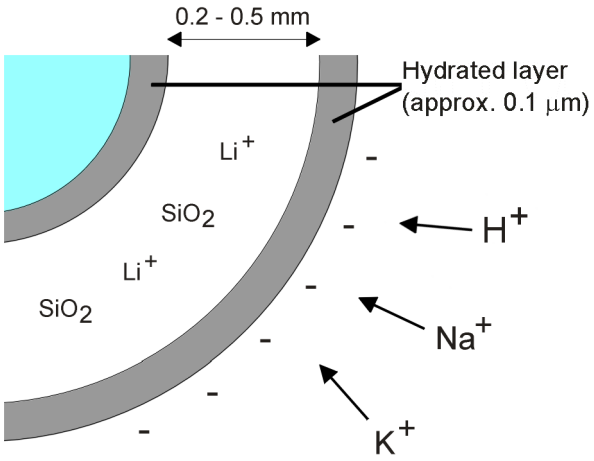
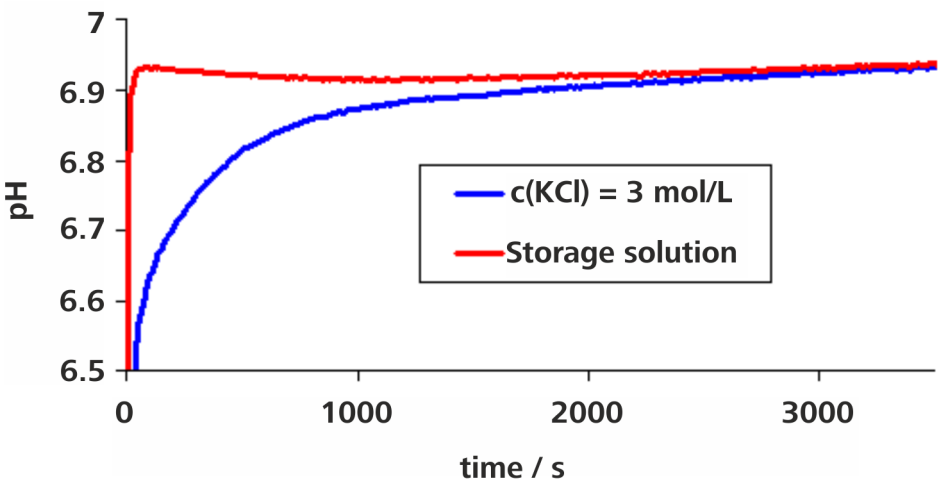
1 General

Glass has a silicate skeleton that forms a thin hydrated layer on contact with aqueous media. The glass structure is softened in this hydrated layer, i.e., ions can penetrate this thin layer and alter the electrochemical properties of the glass. This hydration of the glass surface is essential for the use of glass as a material for pH glass electrodes, as without this hydrated layer no pH measurement would be possible. The structure of glasses used for pH glass electrodes (mainly lithium silicate glasses) has been optimized so that, as far as possible, only protons can penetrate the glass membrane. Given the very slow but continuous hydration process of the glass, however, it is inevitable that other ions will also penetrate the glass. Sodium and potassium ions are of particular importance in this context. At higher concentrations, these will lead to the "alkali error" of glass electrodes, i.e., the measured value will be distorted at relatively low proton concentrations. If a glass electrode is stored for a long time in a solution with a high potassium or sodium content, then these ions will penetrate the glass membrane and lead to prolonged response times of the glass membrane, as the protons first have to displace the "foreign ions" from the hydrated layer.



Cross-section of a pH glass membrane. If several cations are contained in the measuring solution, then these will compete for the free spaces in the hydrated layer. Potassium and sodium in particular can form deposits in the glass membrane, thus leading to longer response times.

One of the most widely used electrolytes for pH measurement is KCl 3 mol/L, as KCl produces a very small diffusion potential at the diaphragm and is also very favorably priced. Normally, a combined pH glass electrode is only stored in KCl 3 mol/L so that it is ready for immediate use without requiring conditioning of the diaphragm. However, long-term storage in KCl damages the glass, since this leads to ever-increasing response times. For the glass itself, the optimal storage medium would be distilled water; however, after such storage, the diaphragm must be conditioned for several hours. The storage solution for combined pH glass electrodes has been specifically developed to solve this problem. If a combined pH glass electrode is stored in the storage solution, then the performance of the glass membrane will remain unchanged with regard to the response time and the alkali error. If, in addition, KCl 3 mol/L is used as reference or bridge electrolyte, then the optimized composition of the storage solution will guarantee that the pH glass electrode is always ready for use. Conditioning before measurement is not necessary, no matter how long the electrode has been stored.



pH measurement in $NaHCO_3$ 0.05 mmol/L. An Aquatrode glass stored in the storage solution exhibits a considerably shorter response time than an electrode glass of the same type stored in KCl for the same period of time.

2 Fields of application

- Aquatrode Plus: The short response time in low-ion solutions is this electrode's most striking feature. This advantage is maintained as a result of storage in the storage solution.
- When a pH glass electrode is to be stored over a prolonged period of several weeks or months.
- When a pH glass electrode is used occasionally, particularly when the measured values are to be compared with one another.
- When the electrode is to be stored between individual series of measurements, particularly in sample changer systems. The pH glass electrode can be automatically parked in the storage solution overnight or after a measurement series has been completed and is again ready for immediate use without conditioning.
- When pH glass electrodes are used for SET titrations: A short electrode response time is particularly important in order to prevent overtitrating of the solution.

CAUTION

pH glass electrodes that are contaminated, corroded by aggressive samples or mechanically damaged cannot be regenerated by the storage solution.

6.043X.XXX Titrodes should not be stored in the storage solution.

3 Use

- The reference or bridge electrolyte must not be replaced with storage solution.
- If a combined pH glass electrode is stored with KCl 3 mol/L as reference or bridge electrolyte, then the filler opening for the reference or bridge electrolyte must be closed. Intermixing of the storage solution with the reference or bridge electrolyte in the diaphragm does not affect the functioning of the electrode.
- If a combined pH glass electrode is to be stored for a prolonged period, then pour 2 to 3 mL of storage solution into the storage vessel instead of KCl 3 mol/L. The filler opening for the reference or bridge electrolyte must be closed.
- If a different vessel is used for storage, then the electrode's diaphragm must be immersed in the storage solution. The filler opening for the reference or bridge electrolyte must be closed.