Agilent I9131 Sodium Combination ISE
钠离子复合电极

Operating Guide
用户手册

Agilent Technologies

The refillable Sodium Combination ISE can measure sodium ion (Na^+) concentration in laboratory. This electrode is used with the 3200I Ion Meter or similar meters.

WARNING **Use this electrode according to the operating manual to avoid personal injury.**

WARNING **The electrode solution can cause chemical burns or illness if it is taken orally or contacted by human skin. Use protective clothing or gloves to avoid contact. In case of contact, rinse contacted area with tap water or DI water thoroughly.**

CAUTION The electrode body material is glass. Handle with care to avoid damage to the instrument.

Table 1 Sodium electrode specifications

Specification	Value
Concentration range	Saturated, 10^{-6} mol/L
Temperature range	0 to 60 °C
Electrode impedance	≤250 MΩ (25 °C)
Reference system	Ag/AgCl
Liquid junction material	Ceramic
Electrode diameter	12 mm
Electrode length	120 mm
Cable connector	BNC
Cable length	1000 mm

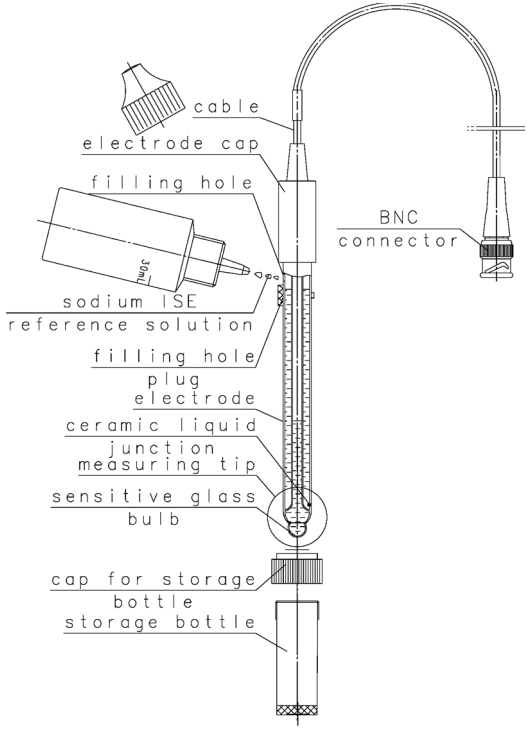

Figure 1 Electrode assembly

Operation

Preparing the electrode

The electrode should be stored wet in the storage solution. It is in working condition when you receive it. Observe visually if there is any mechanical damage. If the storage bottle for this electrode is dry, soak the electrode in sodium ISE reference solution for at least 24 hours before use.

1. Add diisopropylamine (AR grade) to the calibration solution until its pH value is over 10.
2. Take the storage bottle off and store it upright for future use.
3. Rinse the measuring tip with distilled or deionized water.
4. Unplug the filling hole.
5. Hold the electrode measuring tip downwards and swing it for several times to remove air bubbles near the sensitive glass bulb.
6. Connect the electrode to the meter. Fix the electrode vertically at the electrode holder.
7. Revitalize the electrode. Soak the measuring tip in distilled or deionized water. Turn on the magnetic stirrer to stir the deionized water with a steady speed. Soak for 8 hours.
8. Check that the mV reading is higher than 310 mV. If not, repeat step 7 with new deionized water until the mV reading is higher than 310 mV.
9. Remove the electrode from the deionized water solution and absorb away the water from the measuring tip. Do not rub.
10. Refer to relative professional standards to calibrate the instrument.

Calibration

If the meter is an ion meter:

1. Add diisopropylamine (AR grade) into the calibration solution until its pH value is over 10.
2. Calibrate the electrode according to the operation manual of the meter. Choose more than two NaCl calibration solutions.
3. Calibrate the electrode in order from the low to the high concentration.
4. Exchange the calibration solution during calibrating, rinse the measuring tip thoroughly and adsorb away the water on the measuring tip.

If the meter is a mV meter (such as pH meter):

1. Add diisopropylamine (AR grade) into the calibration solution until its pH value is over 10.
2. Calibrate the electrode in more than two NaCl calibration solutions in order from the low to the high concentration.
3. Record mV readings in each calibration solution.
4. Plot 'mV-pNa' linear diagram or calculate the linear equation for the electrode (pNa is negative logarithm of sodium concentration).
5. Exchange the calibration solution during calibrating, rinse the measuring tip thoroughly and adsorb away the water on the measuring tip.

After electrode calibration, repeat step 2 in "Preparing the electrode" on page 6.

Measurement

1. Soak the measuring tip in a sample solution and add diisopropylamine (AR grade) into the sample solution until its pH value is over 10.
2. Record the readings of the meter when the readings become stable.
   a. If the meter is an ion meter, read the concentration value of sample solution directly.
   b. If the meter is a mV meter (such as pH meter), input the mV reading into the 'mV-pNa' linear diagram or the linear equation for the electrode to calculate the pNa value of sample solution.
3. Rinse the measuring tip with DI water. Adsorb away the water on the measuring tip (do not rub hard).
4. Plug the filling hole.

Storage

Short-term

Soak the measuring tip in DI water.

Long-term

1. Place the electrode inside the storage bottle.
2. To protect the measuring tip, keep 5-10 mm between the bottom of storage bottle and the measuring tip of ISE when placing the ISE electrode.
3. Screw the cap onto the electrode storage bottle firmly and place it in the package box.
4. Store the electrode in a dry area.

Operating Hints

- The main material of the measuring tip is glass. Ensure the sample solution will not damage the measuring tip before measurement.

- During measurement, the level of filling solution in the sodium combination ISE must be higher than the level of sample solution.
- During calibration or measurement, rinse the measuring tip with DI water and adsorb away the water on the measuring tip (do not rub hard) before measuring a new sample solution.
- Control the calibration solution and sample solution at a uniform flow rate and temperature by swinging the electrode gently or by turning on the magnetic stirrer. If not the measuring accuracy will be affected.
- Do not soak the electrode in sample solution for a long time. Rinse the electrode with DI water thoroughly as soon as the measurement is completed.
- The sodium concentration range of the calibration solutions should cover the sodium concentration range of sample solution. If not, the measurement errors will occur.
- Do not apply force onto the electrode cap, cable or cable interface. This could cause damage.
- Keep the cable interface dry.

Maintenance

Reference filling solution

1. Drain the electrode filling solution away.
2. Add fresh reference filling solution (p/n 5190-0545) through the filling hole until the level is 5 mm lower than the filling hole.

Repeat steps 1 and 2 to ensure a fresh solution.

Cleaning of inorganics

Soak the measuring tip in 0.1 mol/L HCl or EDTA solution for 15 minutes.

Cleaning of organics

Soak the measuring tip in absolute ethyl alcohol or another solvent that can dissolve organics for 15 minutes.

Cleaning of grease

Soak the measuring tip in warm weakly alkaline detergent for 15 minutes.

Cleaning of protein precipitation

Soak the measuring tip in 0.1 mol/L HCl solution that contains 1% pepsin for 15 minutes.

Electrode restoration

Rub the flat surface of the measuring tip gently with a fine gauze soaked with absolute ethyl alcohol.

After any of the above cleaning procedures, replace the filling solution. Soak the measuring tip in deionized water for 2 hours.

Troubleshooting

Meters

Refer to the meter operating manual. Check all relevant parts, such as electrode, calibration solution, and samples.

Electrode

1. Check the mV value of the calibration solution.
2. Adjust the concentration of the calibration solution to ten times the original value, and measure mV again.

The difference in mV should be more than 52 mV. If not, perform maintenance as described above. Make sure the calibration solution is effective. Use distilled or deionized water that meets requirements to make sure the calibration solution is not contaminated or beyond its shelf life.

Calibration solution

Check the calibration solution. The distilled or DI water used in the solution should meet applicable requirements. Check if the solution is expired or contaminated. Prepare fresh calibration solution if needed and re-test.

Method

Refer to relative documents to ensure that the analytical method is suitable for the sample solution.

If any other problems are observed during electrode use, contact our customer service department.

To purchase a new electrode, contact distributors of Agilent Technologies or log on the Agilent official website.

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概述

实验室钠离子浓度测量用可充式复合钠离子电极，与3200I 仪器或类似仪器配套使用。

安全提示

- 按使用说明使用电极。
- 电极附带的填充液不宜口服或接触人体敏感器官，如意外接触，应立即用自来水或去离子水清洗。
- 本电极主体材料为玻璃，在没有成年人监管时，不要让十八岁以下人接触或使用本电极。

技术参数

浓度范围	饱和 -10 $^{-6}$mol/L
适用温度范围	（0-60）℃
电极内阻	≤ 250MΩ
液接界材料	陶瓷
导线接口	BNC
参比系统	Ag/AgCl
直径	12 mm
长度	120 mm
导线长度	1000 mm

电极插图

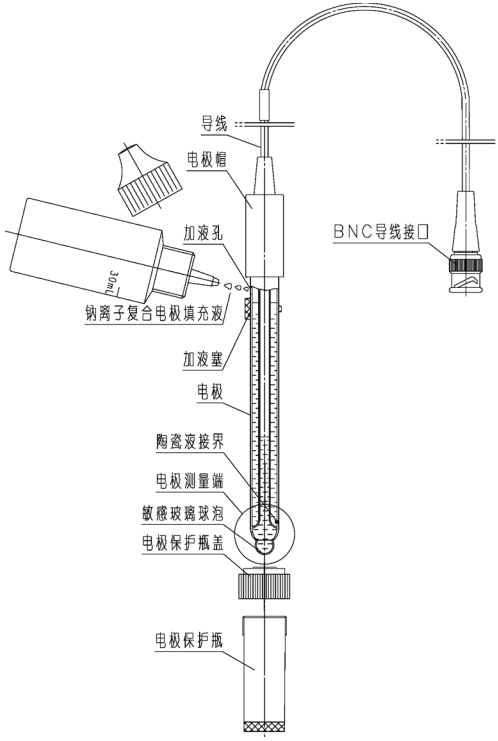

图 1 I9131 电极插图

使用步骤

电极准备

1 旋开电极保护瓶盖，依次取下电极保护瓶、电极保护瓶盖，将电极保护瓶开口向上水平放置待用。

2 开启加液塞用蒸馏水或去离子水冲洗电极测量端，将电极测量端向下，空甩电极数次。

3 将电极与仪器连接。

4 将电极测量端浸于蒸馏水或去离子水中 8h 以上进行活化，更换蒸馏水或去离子水，开启磁力搅拌器使去离子水处于匀速搅拌状态，同时滴加二异丙胺 （AR 级）使其 pH 值大于 10。

5 待仪器 mV 读数稳定后，更换蒸馏水或去离子水，重复步骤 4，直至仪器 mV 读数达到 — 310mV 以上。

6 取出电极，吸干电极测量端表面水迹 （不可用力擦拭）。

7 查阅标准 （国家标准，行业标准等）或相关文献资料，确定电极使用方法。电极的常规使用方法按照以下步骤。

8 电极校正。

a 如果仪器是离子计，则按照仪器说明，选择两种以上的 NaCl 校正溶液，由稀至浓对电极进行校正。期间电极更换校正溶液时，需仔细冲洗电极测量端并吸干表面水迹。校正溶液需滴加二异丙胺 （AR 级）使其 pH 值大于 10。

b 如果仪器是 mV 计 （例如 pH 仪器），则将电极由稀至浓在两种以上的 NaCl 校正溶液中对应 mV 值进行记录，然后绘制 “mV-pNa” 电极线性曲线图或电极的线性校正方程 （其中 pNa 为钠离子浓度值的负对数值）。期间电极更换校正溶液时，需仔细冲洗电极测量端并吸干表明水迹。校正溶液需滴加二异丙胺 （AR 级）使其 pH 值大于 10。

c 电极校正完毕，重复步骤 5。

电极测量

1 将电极测量端浸于被测溶液中，滴加二异丙胺 （AR 级）使其 pH 值大于 10，待仪器读数稳定后记录仪器显示的读数。

2 数据处理

a 如果仪器是离子计，则直接读取被测溶液的浓度值。

b 如果仪器是 mV 计（例如 pH 仪器），则将仪器显示的 mV 读数代入绘制的 “mV-pNa” 电极线性曲线图或电极的线性校正方程，计算被测溶液的 pNa 值。

3 将电极测量端用去离子水冲洗，吸干电极测量端表面水迹 （不可用力擦拭）。

4 关闭电极加液塞。

储存方法

短期储存

将电极测量端浸于去离子水中。

长期储存

将电极保护瓶盖、电极保护瓶安装在电极外壳上，，安装时应使电极与电极保护瓶的底部保持 5-10mm 距离以免造成电极损坏，并旋紧电极保护瓶盖，然后将电极放回电极包装盒内，干燥保存。

注意事项

- 电极测量端的主要材料为玻璃，测量前应确认被测溶液不会对电极测量端造成损伤。
- 测量时，电极的钠离子复合电极填充液高度应高于被测溶液高度。
- 电极校正或测量时，电极测量端接触不同溶液前，均应用去离子水冲洗电极测量端并吸干测量端表面水迹（不能用力擦拭）。

- 建议通过轻晃电极或开启磁力搅拌器的方法使校正溶液或被测溶液保持一定流速。
- 校正溶液和被测溶液的流速、温度应基本保持一致，否则会引起测量误差。
- 请勿将电极长时间浸泡于被测溶液内，电极使用完毕，请仔细对电极进行清洗工作。
- 电极校正溶液的钠离子浓度范围应包含被测溶液的钠离子浓度范围，否则可能引起测量误差。
- 电极帽、导线以及导线接口部分应避免受力，以免损坏。
- 导线接口必须保持干燥。

电极维护

更换钠离子复合电极填充液

1 将电极的钠离子复合电极填充液吸空。

2 从加液孔注入新鲜的钠离子复合电极填充液（5190-0544）至距离加液孔 5mm 左右处。

3 再次吸空钠离子复合电极填充液，从加液孔注入新鲜的钠离子复合电极填充液至距离加液孔 5mm 左右处。

电极清洗和修复

无机物清洗：

将电极测量端浸于 0.1 mol/L 的 HCl 或 EDTA 溶液中 15min。

有机物清洗：

将电极测量端浸于无水乙醇 （或能够溶解该有机物的溶剂）中 15min。

油脂类清洗：

将电极测量端浸于温热的弱碱性洗涤剂中 15min。

蛋白质沉淀的清洗：

将电极测量端浸于含 1% 胃蛋白酶的 0.1mol/L 盐酸溶液中 15min。

电极修复：

用细纱布，蘸取少量无水乙醇，稍用力擦拭电极测量端的平头表面。

电极清洗完毕，应更换钠离子复合电极填充液，并将电极测量端浸没于去离子水中 2h。

疑难解答

电极使用中发现异常情况，请按下列步骤查找原因

- 仪器
  参看仪器说明书的相关部分
  查看仪器、电极、校正溶液、样品等相关部分之间的衔接。
- 电极
  电极校正时，校正溶液浓度值每相差 10 倍，则 mV 值应相差 52mV 以上，否则对电极进行维护操作。
- 校正溶液
  校正溶液来源有效。
  配制校正溶液用的蒸馏水或去离子水应符合要求。
  校正溶液应在有效期内，不污染或变质。
- 方法
  查阅相关资料或文献，以确认测试方法 （样品处理，测试步骤等）是否正确。

如在电极使用过程中有其他疑问，请联系售后服务部门。如需购买，请与安捷伦经销商联系或者登陆安捷伦官方网站。

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