

双阻 NH_4^+ 选择性微电极测定水稻叶片细胞中 NH_4^+ 的活度

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Measurement of NH_4^+ activity in leaf cells of rice using double-barreled NH_4^+ selective microelectrodesYIN Xiao-ming, FAN Xiao-rong, SHEN Qi-rong*^{*}

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摘要

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摘要

本文介绍了双阻 NH_4^+ 选择性微电极的制作方法、工作原理及操作方法。微电极电位响应值与溶液中 NH_4^+ 的活度呈对数曲线的关系, NH_4^+ 选择性微电极与其他类型的电极(如 H^+ 、 NO_3^-)最大区别是 K^+ 的干扰, 在含有72 mmol/L K^+ 的标定溶液中, 电极标定曲线的斜率为48~58 mV, 对 NH_4^+ 的检出限小于 10^{-4} mol/L, 说明电极对 NH_4^+ 有较高的选择性, 受 K^+ 的影响较小, 可以用来测定。用以测定2.5 mmol/L NH_4^+ 培养2周的水稻叶片, 结果表明, 叶片细胞中 NH_4^+ 活度分布在高低不同的两个区间内, 分别代表了细胞质和液泡中的测定, 水稻叶片细胞质和液泡 NH_4^+ 的活度分别为2.58~9.30

mmol/L和11.36~25.20 mmol/L。水稻叶片组织中的 NH_4^+ 主要来自液泡, 流动分析仪测定的水稻叶片组织的 NH_4^+ 浓度为11.12 mmol/L。 NH_4^+ 选择性微电极为研究水稻对 NH_4^+ 的吸收利用提供了技术支撑。

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Abstract:

This paper reported the manufacture method, working principle and operating method of double-barreled NH_4^+ selective microelectrode. An apparent difference of NH_4^+ selective microelectrode from other microelectrodes (such as H^+ and NO_3^- microelectrode) is the interference of K^+ . These microelectrodes showed a typical log linear response to NH_4^+ from 0.01–100 mmol/L in the presence of 72mmol/L K^+ , with a slope of 48 ~58 mV. The detect limit was below 10^{-3} mmol/L. The results showed that the microelectrode was more sensitive and selective to NH_4^+ and could be used on the NH_4^+ measurement. Intracellular measurement of NH_4^+ activity in leaf cells of rice using the double-barreled NH_4^+ selective microelectrode showed that NH_4^+ activity fell into two main populations, one was in the cytoplasm with the NH_4^+ concentrations of 2.58–9.37 mmol/L and the other one was in the vacuole with the NH_4^+ concentrations of 11.36–25.20 mmol/L. Tissue NH_4^+ of rice leaf mainly comes from that of the vacuole. Tissue NH_4^+ concentrations of rice leaf using a continuous-flow auto analyzer were 11.12mmol/L. NH_4^+ selective microelectrode offered technical support for the study of the assimilation and utilization of NH_4^+ in rice.

Keywords:

Received 2008-04-08:

引用本文:

尹晓明, 范晓荣, 沈其荣*. 双阻 NH_4^+ 选择性微电极测定水稻叶片细胞中 NH_4^+ 的活度
[J] 植物营养与肥料学报, 2009, V15(3): 701-706

YIN Xiao-ming, FAN Xiao-rong, SHEN Qi-rong*. Measurement of NH_4^+ activity in leaf cells of rice using double-barreled NH_4^+ selective microelectrodes
[J] Acta Metallurgica Sinica, 2009, V15(3): 701-706

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