Application Note AN-V-239

磷酸铁锂电池中的铁离子含量

Simultaneous determination of Fe(II) and Fe(III) in lithium iron phosphate with the Multi-Mode Electrode pro

Lithium iron phosphate (also known as $LiFePO_4$ or lfp) batteries last for over 2000 charges and are safer because of their lower risk of overheating. $LiFePO_4$ batteries have a slightly lower energy density compared to lithium-ion batteries. However, high discharge rates of lfp batteries make them ideal for electric vehicles, renewable energy storage, and backup power systems. Lithium iron(II) phosphate is used as a cathode material in lithium iron phosphate batteries. Characterization of lfp and monitoring the oxidation state of iron in lfp batteries is relevant to battery performance in terms of durability, capacity, and safety. Additionally, analyzing chemical composition can be useful for battery research and can aid eco-friendly recycling practices. This is essential for driving battery technology forward and promoting clean energy solutions.

Polarographic speciation of Fe(II) and Fe(III) can be used to evaluate the purity of $LiFePO_4$ and its usability as a cathode material in lithium iron phosphate batteries. It can further be used to study the concentrations of Fe(II) and Fe(III) in the cathode material after several charging and discharging cycles to evaluate the aging behavior.

SAMPLE

Pure $LiFePO_4$

EXPERIMENTAL

The lfp sample is weighed, mixed with degassed diluted sulfuric acid, heated at 85 ° C for 15 minutes, and then cooled. Afterward, the digested sample solution is added to the measuring vessel that contains 20 mL degassed electrolyte. Quantification is done using two standard additions with separate Fe(II) and Fe(III) solutions.

Figure 1. 884 Professional VA manual for MME.

Table 1. Parameters

Parameter	Setting
Mode	DME
Start potential	0.0 V
End potential	-1.5 V
Sweep rate	30 mV/s
Peak potential Fe(II)	-0.25 V
Peak potential Fe(III)	-0.8 V

ELECTRODES

- Multi-Mode Electrode pro

RESULTS

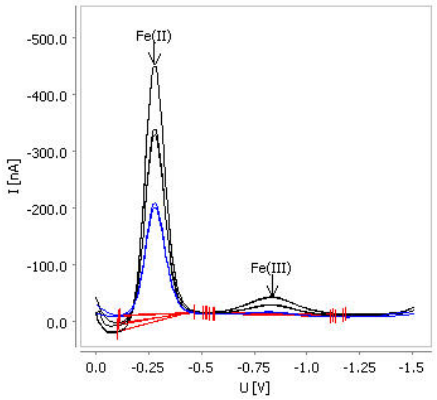

Figure 2. Determination of Fe(II) and Fe(III) in digested lithium iron phosphate with the Multi-Mode Electrode pro.

The viva software delivers unmatched versatility and flexibility by automating data conversion and displaying data in different formats to save time and reduce the risk of errors. Table 2 shows how viva effortlessly translates concentrations from g/L to mg/g of tested material, enhancing understanding of the results for inexperienced users.

Table 2. Result

Sample	Fe(II) (g/L)	Fe(III) (g/L)
Digested $LiFePO_4$	2.8	0.09

Table 2. Result

Sample	Fe(II) (g/L)	Fe(III) (g/L)
Digested $LiFePO_4$	2.8	0.09
Sample	Fe(II) (mg/g)	Fe(III) (mg/g)
$LiFePO_4$	350	11

CONTACT

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CONFIGURATION

(MME) 884 Professional VA manual

用于多模式电极 (MME) 的 884 Professional VA manual 是借助多模式电极 pro 或 scTRACE Gold 或铋液滴电极使用伏安法和极谱法进行痕量分析的入门仪器。此项已经证实的瑞士万通电极技术与恒电位/恒电位仪以及外接的灵活 viva 软件联用,在重金属测定领域中展现了新的前景。带有经认证的校准器的恒电位仪在每次测量之前均自动冲洗进行校准,确保可能的高精度。

通过此仪器也可使用旋转圆盘电极进行测定,例如借助«循环伏安溶出法»(CVS)、«循环脉冲伏安溶出法»(CPVS)和计时电位法(CP)测定电镀池中的有机添加剂。借助可更换的测量头,可在使用不同电极的各种应用之间实现快速切换。

使用 viva 软件进行控制、数据采集和评估。

用于 MME(多模式电极)的 884 Professional VA manual 供货时配备大量附件,包括用于多模式电极 pro 的测量头。电极组和 viva 许可证则须单独订购。