Application Note AN-V-057

滴眼液中的硫柳汞

Voltammetric determination of preservative in vaccines and various pharmaceutical and cosmetic solutions

Thiomersal (also called thimerosal) is a mercury containing organic molecule that has been widely used as preservative for vaccines and eye drops. Other applications of this substance have been for ear drops, storage and cleaning solutions for contact lenses, and in tattoo inks. It is very effective, even in very low concentrations, against a wide range of microorganisms and viruses.

To reduce the risk for consumers the maximum concentration of mercury in the products is limited by the authorities. Typical limit values in the European Union are 0.007% (as Hg) in eye products (EU Commission Regulation 1223/2009) or up to 25 µg thiomersal per vaccine injection dose if vaccines are distributed in multi-vaccine containers.

Polarography or voltammetry can be used to accurately determine the concentration of thiomersal in vaccines or other cosmetic and pharmaceutical solutions (such as eye drops). The method is simple to perform, specific, and free of interferences.

SAMPLE

Vaccine against diphtheria, tetanus, pertussis

EXPERIMENTAL

The sample and the supporting electrolyte are pipetted into the measuring vessel. The determination of thiomersal is carried out with an 884 Professional VA using the parameters specified in Table 1. The concentration is determined using external calibration with a calibration curve recorded from five standard concentrations.

Figure 1. 884 Professional VA.

Table 1. Parameters for voltammetric analysis of thiomersal in vaccine

Parameter	Setting
Working electrode	HMDE or DME
Mode	DP – Differential Pulse
Deposition	none
Start potential	-0.2 V
End potential	-0.6 V
Peak potential thiomersal	-0.45 V

ELECTRODES

- Working electrode: Multi-Mode Electrode pro with standard glass capillaries
- Reference electrode: Ag/AgCl/KCl (3 mol/L) reference electrode with electrolyte vessel. Bridge electrolyte: KCl (3 mol/L)
- Auxiliary electrode: Platinum rod electrode

RESULTS

The determination of thiomersal can be carried out in a simple and straightforward manner with voltammetry. The method is selective and free of interferences.

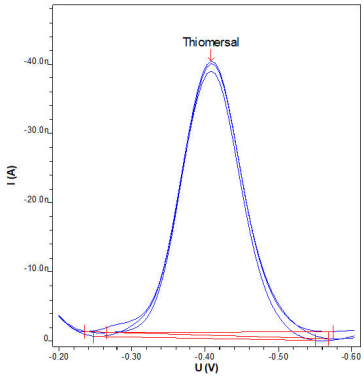

Figure 2. Determination of thiomersal in vaccine sample.

Table 2. Results of the thiomersal determination with the 884 Professional VA

Sample	Thiomersal [mg/L]
DTP vaccine	102

Internal reference: AW BR4-0002-072011

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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。

VA pro Professional VA

整套电极组,用于极谱和伏安测定。包含多模式电极 pro、参比电极、铂辅助电极、量杯、搅拌器、电解质溶液和其它用于构建工作台以及运行多模式电极的附件。