



Application Note AN-V-240

Determination of total iodine in thyroid tablets with polarography

Polarography in pharmaceutical analysis: indirect determination of iodine after dry ashing in a muffle furnace

Thyroid hormones are made by the thyroid gland and play an important role in regulating metabolism and growth. Iodine acts as a building block and the specific number of iodine atoms determines the type of the hormone: four for thyroxine (T4) and three for triiodothyronine (T3). The number of iodine atoms is critical for the functionality of thyroid hormones. Levothyroxine and liothyronine (synthetic forms of thyroid hormones T4 and T3) are essential components of thyroid tablets. T4 is less active and

needs to convert to the more active T3 to be fully effective. Accurate iodine determination in thyroid tablets is a crucial quality control measure, ensuring the effectiveness and safety of thyroid treatments.

A robust method is introduced for indirect determination of total iodine content in thyroid tablets as iodate, according to United States Pharmacopeia (USP) guidelines using the 884 Professional VA and the Multi-Mode Electrode pro.

SAMPLE

Commercially available thyroid tablet containing 100

μg levothyroxine and 20 μg liothyronine.

EXPERIMENTAL

Sample preparation and the determination of iodine is carried out according to the USP monograph «Thyroid Tablets». The process involves dry ashing of the tablets, where organically bound iodine is released and later converted to iodate. The iodate content is determined with the 884 Professional VA (Figure 1) by differential pulse polarography.



Figure 1. 884 Professional VA.

ELECTRODES

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

Table 1. Parameters for IO₃ determination

| Parameter | Setting |
|-----------------------|-------------------------|
| Working electrode | DME |
| Mode | DP – Differential Pulse |
| Start potential | -0.8 V |
| End potential | -1.5 V |
| Potential step | 0.005 V |
| Potential step time | 1 s |
| Pulse amplitude | 0.05 V |
| Peak potential Iodate | -1.18 V |

RESULTS

Calculation of the results was carried out according to the USP monograph «Thyroid Tablets».

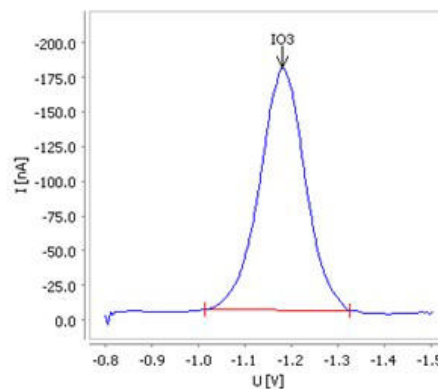


Figure 2. Determination of iodate in a thyroid tablet by differential pulse polarography with the 884 Professional VA and the Multi Mode Electrode pro.

Table 2. Results of iodine determination with the 884 Professional VA and the Multi-Mode Electrode pro.

| Sample | Iodine in μg / tablet | Recovery rate |
|--|----------------------------------|---------------|
| Tablet | 70.59 | 92.3% |
| Tablet spiked with 72.55 μg | 144.58 | 101.9% |

RESULTS

Internal reference: AW VA CH-0633-042024

CONTACT

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CONFIGURATION



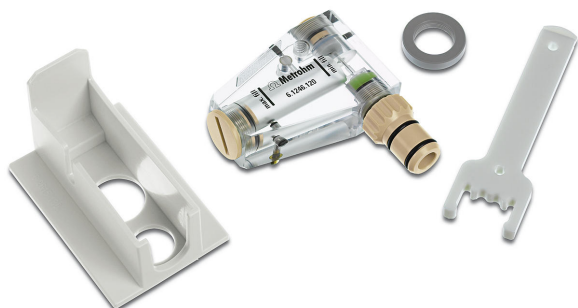
884 Professional VA manual per l'elettrodo Multi-Mode (MME)

L'884 Professional VA manual per l'elettrodo Multi-Mode (MME) è il modello base per la analisi delle tracce di fascia alta con voltammetria e polarografia con l'elettrodo Multi-Mode, l'elettrodo scTRACE Gold o l'elettrodo a goccia di bismuto. La comprovata tecnologia degli elettrodi Metrohm, in combinazione con un potenziostato/galvanostato potente e il software viva estremamente flessibile, apre nuove prospettive per la determinazione dei metalli pesanti. Il potenziostato con calibratore certificato si regola automaticamente prima di ogni misurazione e garantisce la massima precisione possibile.

Con lo strumento possono essere eseguite anche determinazioni con elettrodi a disco rotante, per esempio determinazioni di additivi organici in bagni galvanici con «Cyclic Voltammetric Stripping» (CVS), «Cyclic Pulse Voltammetric Stripping (CPVS) e cronopotenziometria (CP). La sonda di misura sostituibile consente il cambio rapido tra le varie applicazioni con elettrodi diversi.

Per il controllo, la registrazione e la valutazione dei dati è necessario il software **viva**.

L'884 Professional VA manual per MME viene fornito con una vasta gamma di accessori e una sonda di misura per elettrodi Multi-Mode pro. Il set di elettrodi e la licenza **viva** devono essere ordinati separatamente.



Elettrodo Multi-Mode pro

Elettrodo in mercurio per la voltammetria. Può essere utilizzato come DME, SMDE o HMDE.