ISSN: 2582-5887; Peer-Reviewed Refereed International Journal (UIJES); Volume-5, Special Issue 2(January-2024);
Impact Factor: 6.71(SJIF)

Reduction behavior of chloro genic acid(CGA) on the surface of carbon nano tubes paste electrodes dopped with silver nano particles

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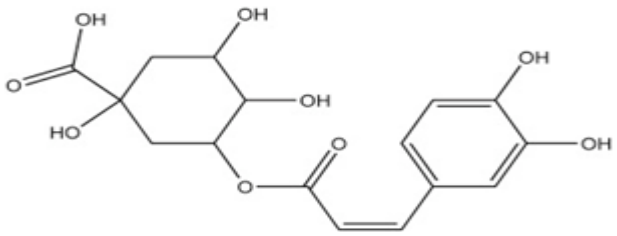
Abstract:
The crux of this article is to study the reduction electrode kinetics of chlorogenic on the surface of CNTPE dopped with silver nano particles. The electro analytical technique chosen is differential pulse adsorptive striping voltammetry. Under the optimized conditions, the Reduction peak current is linearly increased with concentration of CGA in the range from 3.01×10^{-7} to 3.20×10^{-5} mol/L and the detection limit is 3.00×10^{-8} mol/L. Further, the recital of the method adopted has been checked in terms of linearity, recovery (96.3–98.5%), reproducibility and robustness. The method has been fruitfully applied for the estimation of CGA in Moringa tierosperma..

Keywords: moringatero sperma ,cyclic voltammetry,carbon nano tubes paste electrode.

1.Introduction

Chlorogenic acid(CGA) is a component of vegetable matter chiefly present in plants like moringa terospersma and regulate the sugar componants in the patients of type 2 diabetics .



Chlorogenic acid

Various methods for the determination of CGA have been developed, namely, near-infrared spectroscopy [1-3], capillary electrophoresis [4,5] nano-liquid chromatography-electrospray ionization mass spectrometry , high-performance liquid chromatography , ultra-performance liquid chromatography , liquid chromatography-mass spectrometry , chemiluminescence , and electrochemical methods .Electrochemical methods[6-10] are obviously better due to their convenience, speed, higher sensitivity, and reproducibility. For electrochemical determination of CGA from the leaf extractions of moringa tierosperma, carbon nano tubes paste electrodes used as working electrode in this method.

2.0 Experimental

2.1 Sample preparation

Leafs collected from YAGCW botanical garden was carefully ground to a fine powder and sieved through a 600-mesh screen, then 5.0 g of the powder was extracted with 30 mL of ethanol for 30 minutes with ultrasonic agitation. The resulting mixture was filtered and the residue was similarly extracted twice. All filtrates were transferred into a 100 mL volumetric flask and diluted to scale with ethanol.

3.0 Instrumentation

Investigations performed by taking assistance of a model meterohm Auto Lab 101 PG stat (Netherlands). CNTPE doped with

silver nano particles as working electrode for differential pulse adsorptive stripping voltammetry and cyclic voltammetry. pH measurements were carried out with an Eutech PC_510 cyber scan. Meltzer Toledo (Japan) Xp26 delta range micro balancer were used to weigh the samples during the preparation of standard solutions. All the experiments were performed at 25^0C.

Fig 1.0: Meterohm Auto Lab 101 PG stat

4. 0 Computations

Voltammetry measurements were made in an un stirred, non de aerated pH 5.0 borate buffer and all potentials were measured and reported versus Ag/AgCl. In a typical run, 10 mL of pH 5.0 borate buffer, 10 mL of ethanol/water and 0.025 mL of CGA sample solution were transferred into the electrolytic cell. Accumulation was firstly performed under open-circuit with stirring for 30 seconds. Then voltammograms(fig:2.0) were recorded. The method is proven as sensitive method with markable recovery (96.3–98.5%).

5.0 Reliability Of Method

The precision of the method was validated under the optimized conditions in terms of repeatability (intra-day) and intermediate precision (inter-day). Six replicate measurements for each of five samples containing lower, middle, and higher concentrations in the linear range were made over a single day (intra-day, $n = 6$) and for 5 days over a period of 1 week (inter-day, $n = 6$). The recoveries(96.3–98.5%). obtained confirmed the high accuracy

and the relative standard deviations obtained confirmed the good precision of the method.

6. Conclusions

A CNTPE dopped with silver nano particles for the voltammetric determination of CGA was fabricated. The fabricated electrode showed an excellent electrocatalytic effect toward the reduction of CGA and the reduction peak currents of CGA were remarkably increased at the CNTPE dopped with silver nano particles. Based on the electrocatalytic effect, a convenient method for the determination of CGA was developed and the proposed method showed good recovery, reproducibility, and sensitivity.

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