

## **Effect of Inhaling of Perfume on the Blood of Human Healthy Male Using Electrochemical Method by Cyclic Voltammetry**

### **Abstract**

All people in the world were used perfume in different manufactures and marker, in this study, we wanted to be found the effect of continues using of perfume and still inhaling these compound on the human healthy by electrochemical analysis using cyclic voltammetry. In the scientific knowledge, the inhaling of perfume by breathed and then reach to the blood stream through lungs and pulmonary alveoli passing to the blood vessels. The study focused on the oxidation – reduction peaks current of the cyclic voltammogram which can be found from the perfume in healthy blood of male samples. It was found from the results that many oxidation peaks current appeared in the cyclic voltammogram in the blood medium with presence of the perfume, also, in different concentration, and different temperatures were studied, so all perfume compound were effected on the blood components of the male. The oxidative effect of the perfume on blood medium which may be caused the damage of blood components through the continuance of using it and appeared a risk cases of different diseases. the advices for correct using of the perfume in a little amount and in limited using every day, also avoid using the perfume to the patients with high fever.

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Keywords: cyclic voltammetry, perfume, blood of male, oxidation – reduction, temperature, concentration.

### **Introduction**

Cyclic voltammetric technique has a good method for identified the toxicity of the contained materials in blood media by the oxidation – reduction reaction, different studies depended these methods [1-5].

Oxidative stress plays a pivotal role in the pathogenesis of many diseases, but there it is no accurate measure of oxidative stress or which antioxidants are of benefit in the clinical setting. Cyclic voltammetry is a widely used electrochemical technique for redox state analysis in industrial and research settings. It has also been recently applied to assess the antioxidant status of biological samples in vivo [6].

Electrochemical nanosensors have been developed from composite metal oxide (MO) particles by supporting them on a gold (Au) electrode. The activity of the developed nanosensor towards detection of a malaria biomarker ( $\beta$ -hematin) was determined and the optimal conditions under which maximum detection and quantification occurred were determined [7].

A cyclic voltammeter was used to study the electrochemical behavior of ascorbic acid on a carbon paste electrode. Ascorbic acid showed an irreversible oxidation peak at around +470 mV. While the peak change observed with pH in the range from 0.5 to 6.0 indicated the participation of protons during the oxidation of ascorbic acid, the peak potential shift with the scan rate in the range 10–300 mV/s confirmed the irreversibility of the oxidation reaction [8].

An electrochemical method for the determination of 2-naphthylamine (2NAP) in perfumes by differential voltammetry (DPV) using a cathodic boron-doped diamond (BDD) electrode. A simple dilution of the sample in a supporting electrolyte was performed prior to electrochemical analysis. A buffered borate solution of pH 10.0 had a 20% (volume/(LOD) of 0.0046  $\mu\text{mol L}$  with a linear range of 0.5–90  $\mu\text{mol L}$  and RSD <2.9%, respectively. The recovery values for samples spiked with 2NAP were between 102 And 104% the proposed method is feasible to be applied for 2NAP detection and quantification of perfume samples with simple sample preparation [9].

The voltammetric oxidation of five semi-substituted acetophenone derivatives (containing nitro, chloro, bromo, methyl and hydroxyl groups as substituents) and those of benzophenone on a platinum and glassy carbon electrode in acetonitrile medium was studied. Electrode passivation is observed in the case when all selected compounds are on a glassy carbon electrode; The oxidation peak appeared between 2.5 and 3 eV. The voltamogram of 4'-hydroxyacetophenone showed an additional peak around 2 eV, which may be associated with oxidation of the phenolic moiety [10]

In this study, cyclic voltammetric method was used to identified the effect of perfume in blood medium through inhaling the fume of perfume.

## **Experimental**

### **Materials and Methods**

Samples of perfume from different company, healthy male blood samples received from Baghdad medical city center in Iraq, and deionized water.

## **Methods**

### ***Apparatus***

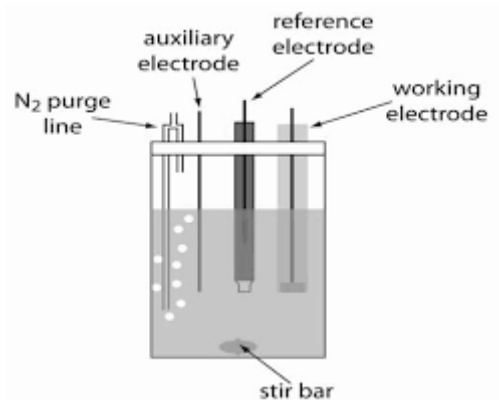
Adapted by NuVant Systems Inc. Pioneering Electrochemical Technologies, USA, In this study to evaluate the electrochemical properties of rifampicin in vitro using an EZstat (potentiostat/glvanoostat) series device. In order to output the cyclic voltammogram test, the electrochemical workstations of the integrated analytical system are connected to a personal computer with a potentiostat operated by electrolysis software. In addition to using Ag/AgCl (3 M KCl) to calculate the reference while using Platinum wire (1 mm diameter) as a counter electrode as shown in Fig. 1.



**Fig. 1: setup of cyclic voltammetry**

### ***Procedure***

Glassy carbon electrode (GCE) was used after cleaning with alumina solution and treated with ultrasonic pathway water for 10 minutes. The three electrodes (reference electrode, silver / silver chloride (Ag / AgCl) at 3M KCl, platinum wire auxiliary electrode with a diameter of 1 mm and glassy carbon electrode as working electrode) were immersed in a cyclic voltammetric cell (15 ml) contain (1 ml of blood:9 ml of distilled water) as shown in Fig.2. All three electrodes were connected with the potentiostat and with personal computer [11].

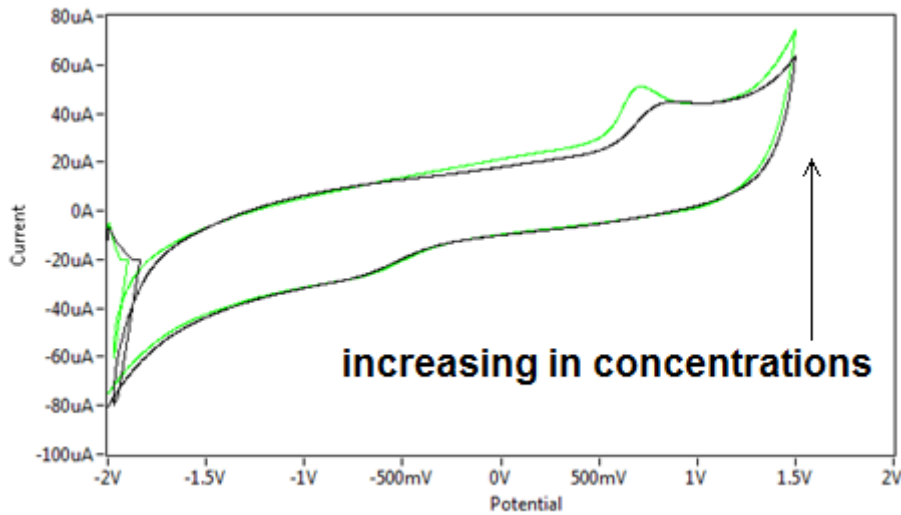


**Fig. 2: Scheme of cyclic voltammetric cell**

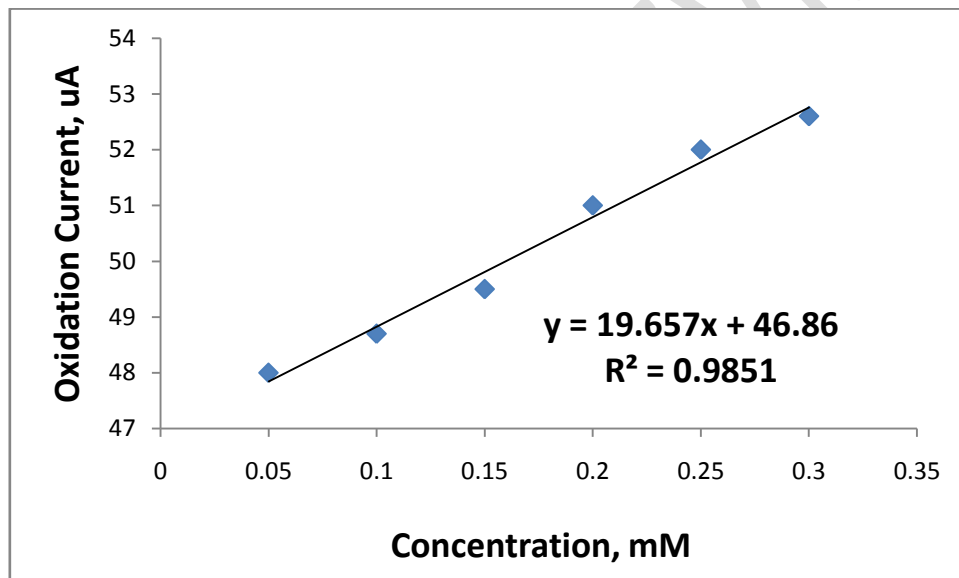
## **Results and Discussion**

### ***Effect different concentrations***

Perfumes one of the derivatives of aldehydes and ketones of different chemical compounds. The electrochemical properties was studied by cyclic voltammetric method, one of these study is the effect of different concentrations of the perfume in the blood medium of male samples, Fig. 3 shows the cyclic voltammogram of the effect different concentration of perfume on the oxidation – reduction peak current, it was found one peak of oxidation current at potential of 750 mV and one peak of reduction current at potential of -750 mV. the oxidation peak was enhanced by increasing of the concentration of perfume injected in the serum blood medium, while the reduction peak was still in the same density of current value. The calibration curve of the relationship between the oxidation peak current has a good linear line with equation of  $Y= 19.657X+46.86$  and high sensitivity of  $R^2=0.9851$  as shown in Fig. 4, it means that the different concentraions of perfume effected on the components of blood with homogeneous reaction between the perfume and blood [12].



**Fig. 3:** Cyclic voltammogram of perfume in human blood medium for healthy male at different concentrations on GCE (working electrode) and Ag/AgCl (reference electrode).



**Fig. 4:** relationship between oxidation peak current of perfume in human blood medium of healthy male against to different concentrations at scan rate 0.1 Vsec-1.

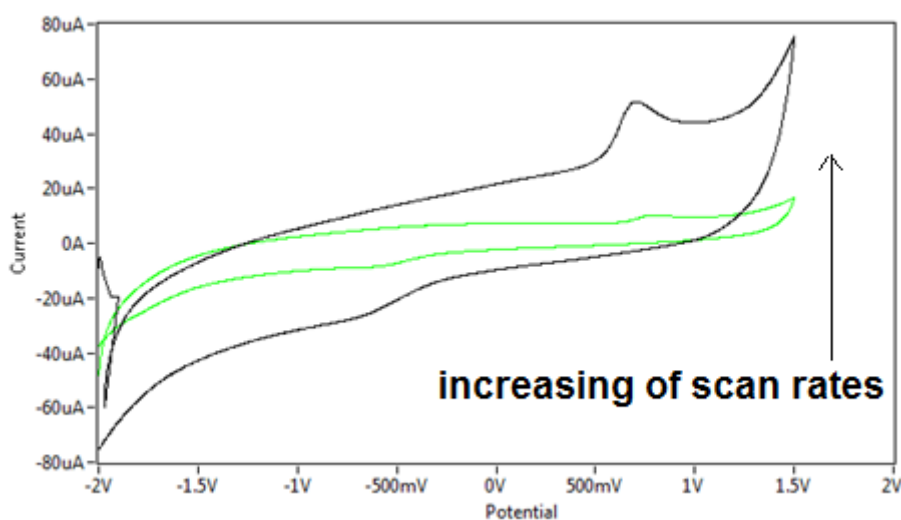
#### *Effect Different Scan Rates*

Fig. 5 illustrated the cyclic voltammogram of perfume in blood medium at different scan rates from 0.01 to 0.1 Vsec-1, there are homogeneous relationship in both oxidation and reduction peaks current of perfume in blood medium against to increasing the scan rates as shown in Fig. 6 and Fig. 7, respectively [13].

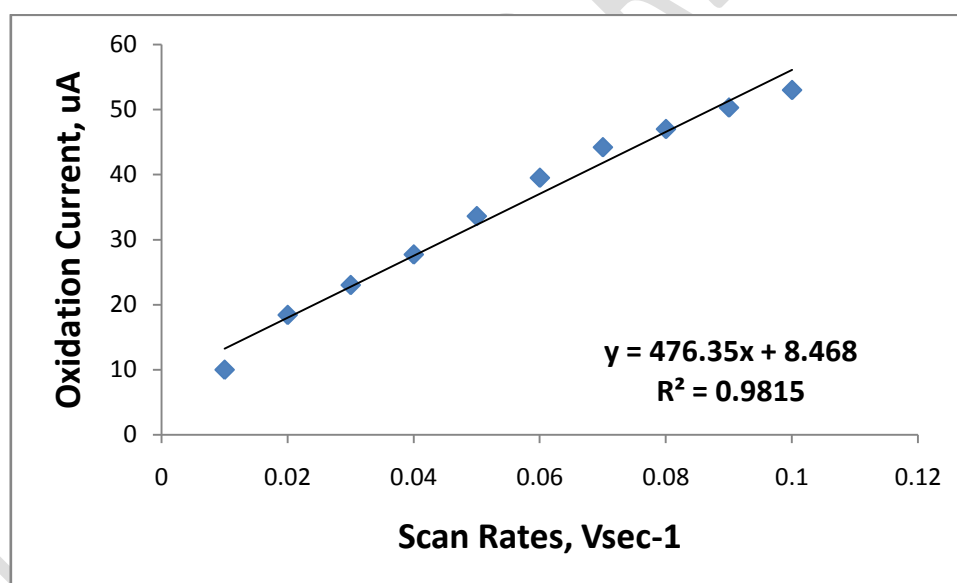
The oxidation – reduction peaks current equations with sensitivity in the following:

Oxidation peak:  $Y = 476.35X + 8.468$  with high sensitivity  $R^2 = 0.9815$

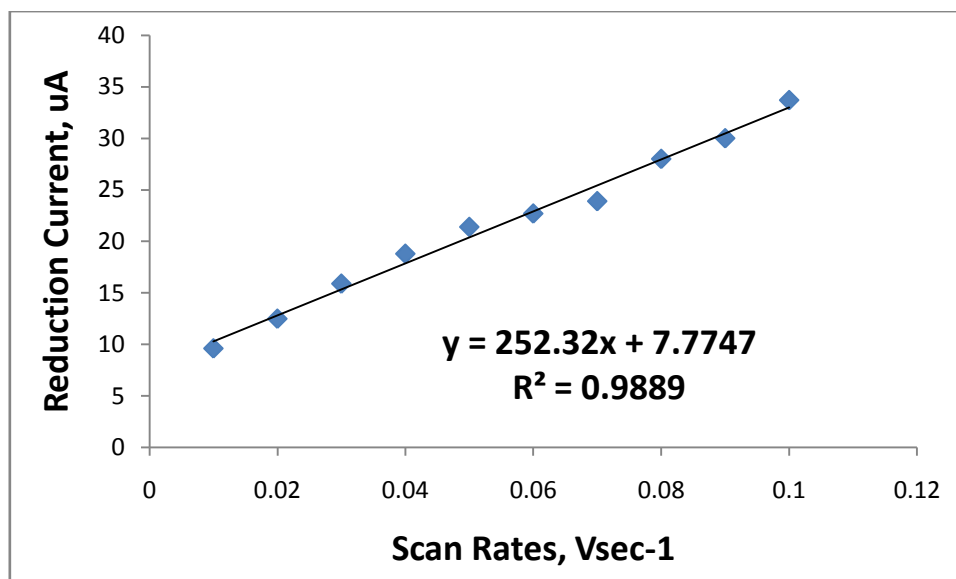
Reduction peak:  $Y = 252.32X + 7.7747$  with high sensitivity  $R^2 = 0.9889$



**Fig. 5:** Cyclic voltammogram of perfume in human blood medium for healthy male at different scan rates (0.01 – 0.1 Vsec-1) on GCE (working electrode) and Ag/AgCl (reference electrode).



**Fig. 6:** relationship between oxidation peak current of perfume in human blood medium of healthy male against to different scan rates (0.01 – 0.1 Vsec-1).



**Fig. 7: relationship between reduction peak current of perfume in human blood medium of healthy male against to different scan rates (0.01 – 0.1 Vsec-1).**

#### *Effect Different Temperatures Study*

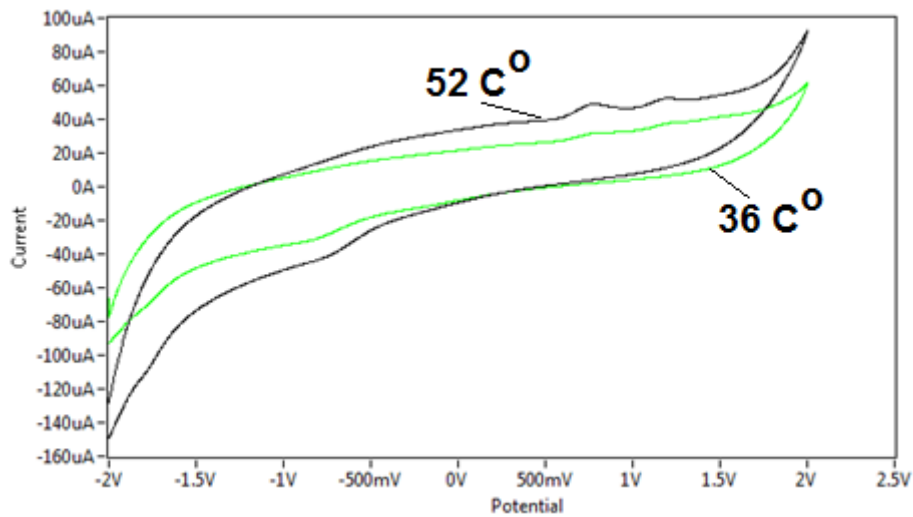
The behavior of perfume in blood medium in different temperatures from 36 C° to 52 C° was studied by cyclic voltammetry. Fig. 8 illustrated the cyclic voltammogram of perfume in blood medium at low and high temperatures to evaluate the effect the fever for patients on the using of perfume, it was found from the results the higher temperature cause to enhancement the oxidation peak current which became two peaks [14].

The relationship between logarithm of oxidation peak current (Ln (I<sub>pa</sub>)) and for reduction peak (Ln (I<sub>pc</sub>)) of perfume in blood medium against to the inverse temperatures as shown in Fig. 9 and 10..

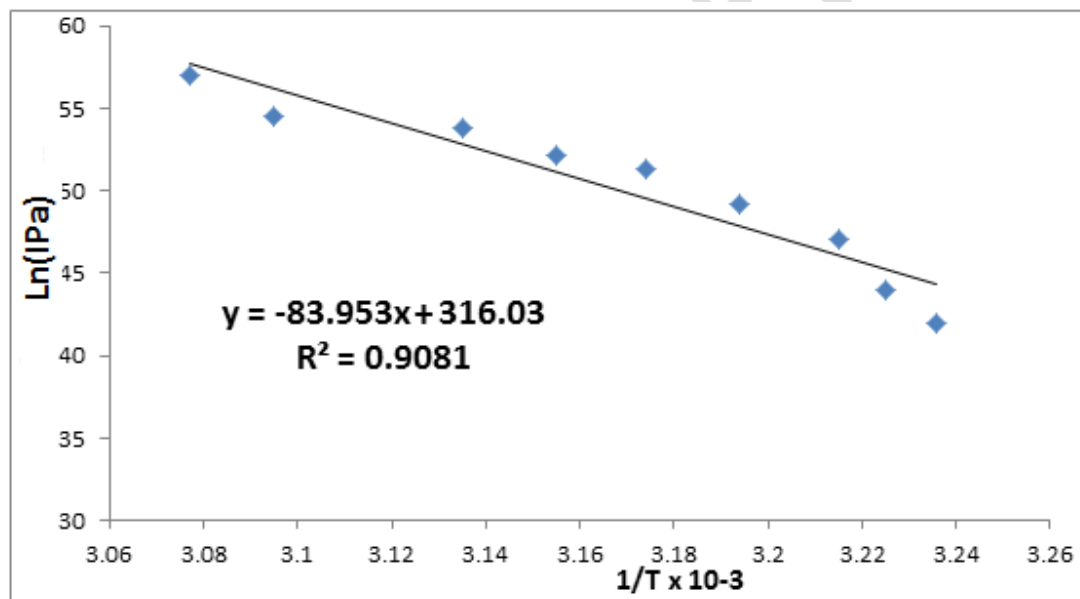
The oxidation – reduction equations was found from the Fig. and respectively as in the following:

Oxidation:  $Y = -83.953X + 316.03$  with high sensitivity of  $R^2 = 0.9081$

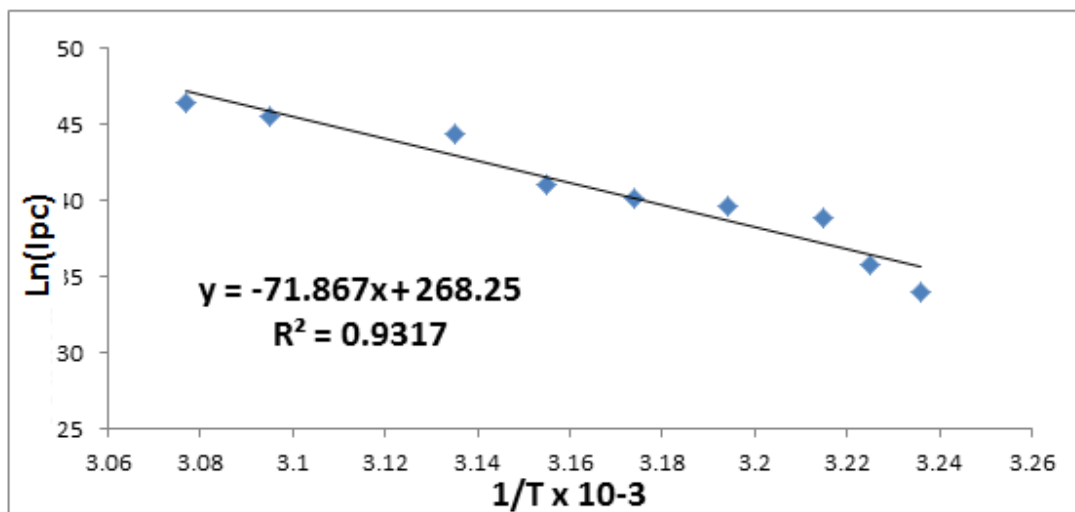
Reduction:  $Y = -71.867X + 268.25$  with high sensitivity of  $R^2 = 0.9317$



**Fig. 8:** Cyclic voltammogram of perfume in human serum blood medium for healthy male at different temperatures (36 – 52 °C ) on GCE (working electrode) and Ag/AgCl (reference electrode) at scan rate of 0.1 Vsec<sup>-1</sup>.



**Fig. 9:** relationship between oxidation peak current of perfume in blood medium against to different temperatures



**Fig. 10: relationship between reduction peak current of perfume in blood medium against to different temperatures**

**Calculation of Activation Energy (Ea\*)**

Activation energy was determined using Arrhenius equations 1, 2, and 3 [15,16]

$$\sigma = \sigma_0 \text{Exp}(-E^*/RT) \dots\dots\dots(1)$$

$$D = D_0 \text{Exp}(-E^*/RT) \dots\dots\dots(2)$$

where  $\sigma / D$  refer to conductivity / diffusibility

while  $\sigma_0 / D_0$  represent standard conductivity / the initial diffusibility

$$I_p = \text{Exp}(-E_a^*/RT) \dots\dots\dots (3)$$

Where:

$I_p$ : Current peak. ( $\mu\text{A}$ )

$E_a^*$ : Activation energy (kJ/mol).

R: Ideal gas constant (8.314 J/mol·K).

T: Temperature in K.

The activation energy of oxidation – reduction peaks current of perfume in blood medium was determined from the Arrhenius equations as in the following:

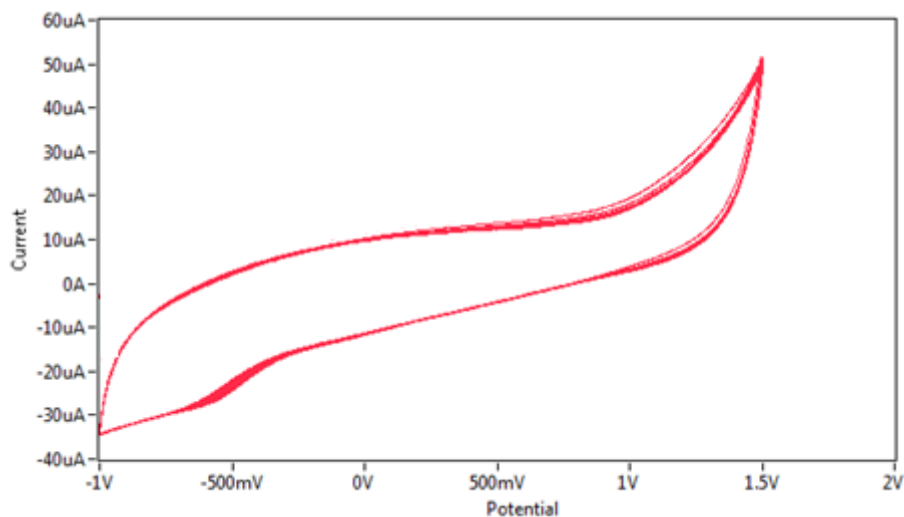
Oxidation:  $E_a^* = 697.96 \text{ J.mol}^{-1}.\text{K}^{-1}$

Reduction:  $E_a^* = 597.50 \text{ J.mol}^{-1}.\text{K}^{-1}$

**Reliability and Stability Study**

The reliability and stability for studying in the cyclic voltammetric technique is needed to prove the results, so the cyclic voltammogram repeated for ten times

scanning to show the overlapping of these voltammogram. Fig. 11 shows the cyclic voltammogram for ten times scanning of perfume in blood medium which have totally overlapping the scanning to prove the correct results from these technique [17].



**Fig. 11: cyclic voltammogram of perfume in blood medium at ten scanning on GCE and Ag/AgCL as reference electrode at scan rate of 0.1 Vsec<sup>-1</sup>**

## Conclusion

In this study, the electrochemical method by cyclic voltammetric technique success to evaluate the effective of perfume fume on the human blood samples at different temperatures and concentrations as in the following:

- 1.the high dose of perfume exposed the male every day causes an oxidative stress to the blood components that make a damage and risk for all organs body .
- 2.the patient which has high fever must be avoid inhaling the perfume because the high temperatures causes appearing many oxidation peaks with high intensity.
3. perfumes are chemical compounds, these compounds have different effected on the health of human, so need to take care of using these materials in extreme necessities.

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