

The Trivector Analysis of Homeopathy, A Three-Dimensional Description of Voltammetric Polarographic Measures

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A three-dimensional (Trivector) topological field is measured which shows the relationships among various time-dependent voltammetric techniques using microelectrodes. Intersections of the surface with appropriately oriented planes represent conventional polarography, chronopotentiometry, polarography at a stationary electrode, and constant-potential voltammetry. Homeopathy is dependent on a shape transfer process. The activation of neuro-emotional shape receptors can offer an explanation of homeopathy. Our trivector three-dimensional topological field time-dependent voltammetric techniques offers a good compatibility with the trivector resonance system. This has been shown to provide an accurate system of homeopathic analysis. This article will only deal with the three-dimensional topological field time-dependent voltammetric techniques as part of a whole system for homeopathic shape analysis. This article is to propose a start of the theoretical discussion.

The new techniques arrived from this model is part of a greater technique of homeopathic medicine analysis.

Scientific Principles

1. The liquid crystal nature of the polar substance water is a well known scientific principle.
2. The memory of water to retain and return to its crystal polymorphic shape structure is also well known.
3. Electrochemistry (polarography, chronopotentiometry,) are standard accepted scientific principle. of modern chemistry for chemical analysis.
4. The dynamics of the chemical information transfer of hormones through shape receptors in the cell is the basis of all pharmacology. All hormones work by stimulating these shape receptors. The plasticity of these receptors has allowed synthetic chemistry to appear to work. Shape receptor stimulus is our fourth scientific principle.

These four well known scientific facts offers us an explanation for understanding and proving high potency homeopathy as a medical treatment. This science also offers us a superb homeopathic quality control procedure. Now homeopathy can be proven, tested, understood, and defended with these scientific principles.

The principle of water's liquid crystal shape capacity and homeopathy was demonstrated by Nelson in 1997 (IJMSH). Here several homeopathics were frozen and analyzed for repeatability. In this journal the electrochemical reactivity of homeopathic remedies were also well determined. The analysis of conductive resonance, magnetic resonance, and capacitance states were proven a window of examination analysis. Voltammetry or electrochemistry offers a potential more efficient and accurate system of examination. A trivector voltammetric analysis has been done by others, and a refined variation of this process has proven valuable for homeopathy.

THE 3d model of Reilley, Cooke, and Furman (8) has proved valuable in representing clearly the relationships among various time-independent electrometric techniques. This success leads naturally to the question of whether time-dependent voltammetric processes can be similarly portrayed. It is obvious that a unique current-potential-time surface can be drawn for a given system. But the current-potential relationship at a given time in that system is dependent on its previous history. Nevertheless, it is possible to draw a representative surface which shows clearly the relationships among various techniques and predicts qualitatively the results to be expected. To properly use the correct equation for the process

see figure A. For a sample of Trivector Data Stream based on a three dimensional analysis of the electro-chemical signature of a homeopathic

(3)

(6)

(⁹)

$$K = nFC^{\circ}_A / D^{\circ}$$

(5) (2).

7r

see figure B.

Potential is in units of $60/n$ mv. and units of current and time are arbitrary. Adjustment of a constant included in the equation of the surface gives quantitative agreement with rigorous theory in most cases.

To reduce complication to a minimum the following discussion will consider only the case in which the electroactive substance is initially present entirely in the oxidized form and only cathodic currents are passed. The equation for the surface representing the system is

$$E = E^\circ + \frac{RT}{nF} \ln \frac{f_0 D_R + nF i \sqrt{t}}{fR D_0 + nF i \sqrt{t} K}$$

where

E = potential of the electrode with respect to a suitable reference E° = standard potential with respect to the same reference

R = gas constant

T = absolute temperature

F = Faraday's constant

n = number of electrons involved in the electrode reaction

f = activity coefficient. The sub-script 0 refers to the oxidized form and R to the reduced

D = diffusion coefficient

i = current density

t = time from start of experiment

K = an adjustable constant independent of time, current, and potential but dependent on other experimental parameters and the process under consideration

In simple terms, the dimension-less quantity Q defined by the equation

$$Q = \frac{RT}{nF} \ln \frac{f_0 D_R + nF i \sqrt{t}}{fR D_0 + nF i \sqrt{t} K}$$

will be used.

A portion of the surface generated by Equation 1 is depicted in Figure B. Various voltammetric processes can be represented as surfaces intersecting with the surface of Figure B.

CONVENTIONAL POLAROGRAPHY

In conventional polarography with the dropping mercury electrode, each drop-life can be considered as a separate experiment in which a constant potential is applied and current is measured at a given time, the drop time. This change or drop as you wish, demonstrates a signature effect of distinct variance of a material. This constitutes the voltammetric signature effect. The elements in the measured material and their arrangement will create the signature.

Thus a complete polarogram is represented by the intersection of the surface of Figure 1 with a plane parallel to the current and potential coordinates. Such an intersection is indicated by the curve *BC*. In this case the constant *K* of Equation 1 can be written as

$$K = nFC^{\circ} \sqrt{D_0} / \sqrt{t}$$

where C° is the original bulk concentration of the reducible species. Since K divided by \sqrt{t} is equal to the diffusion current, i_d (5), Equation 1 reduces to $B = \ln \frac{i}{i_d}$ (4)

which is indeed the equation for the polarographic wave (S).

CONSTANT-POTENTIAL VOLTAMMETRY

In constant-potential voltammetry, a constant potential (Voltage) is applied and the current (Amperage) is measured as a function of time. The process is thus represented by the intersection of the surface with a plane parallel to the current and time axes. Typical intersections are given by the curves *AB* and *DC* of Figure B. In this case the constant *K* of Equation 1 can be written as

The expression for current as a function of time is, by combination of Equations 1 and 4,

$$i = \frac{nFC^{\circ} \sqrt{D_0}}{\sqrt{t}} \frac{1}{1 + \exp \left(\frac{K^2 t}{4D_0} \right)}$$

This is, in fact, the correct expression for such a process (1).

CHRONOPOTENTIOMETRY

In chronopotentiometry a constant current is applied and the potential is measured as a function of time. This process corresponds to the intersection of the surface with a plane parallel to the time and potential axes. Such an intersection is indicated by the curve *AD* of Figure B. In theory the curve thus generated starts at a potential of positive infinity at time zero and goes to negative infinity at the transition time. In actual practice, of course,

see figure C

the electrode at time zero is at some poorly poised potential determined by impurities or capillary-active substances in solution. At the transition time a new electrode process, the reduction of some other species, the supporting electrolyte, or the homeopathic, controls the potential.

For a chronopotentiometric process the constant *K* becomes

$$K = nFC^{\circ} A / \sqrt{r} \sqrt{D_0} / 2 (7)$$

The transition time, the time at which the potential goes to negative infinity, is defined by the equation (2)

$$1/r = nFC^{\circ} \sqrt{D_0} / 2i (8)$$

Thus Equation 1 reduces, in this case, to

$$B = 1n^{-Vr} \frac{-}{t}$$

POLAROGRAPHY AT A STATIONARY ELECTRODE

In polarography with a stationary plane electrode in unstirred solution, a potential is applied which changes linearly with time. This corresponds to the intersection of the current-potential-time surface with the plane generated by the function $E = K_1 - K_2t$, where K_1 and K_2 are constants. This intersection is seen

in Figure 2. The curve of intersection predicts an infinite current at time zero, a precipitous drop in current during the first few moments of scan, a rise to a maximum current at a potential slightly beyond E° , and then a slow decay. Neglecting the discontinuity at time zero, this is the behavior predicted by more precise theoretical calculations (9) and substantiated by experiment. Unfortunately, in this case, no value of the constant K of Equation 1 gives

asa _ gala

(12)

r - t

(15)

(16)

exact correspondence with rigorous theory. On the other hand, reference to Figure 2 makes the reasons for the qualitative shape of the curve readily apparent. During the initial portion of the scan, the system moves toward the cathodic potential plateau and the current increases. Once this plateau is reached, changing the potential to more cathodic values has no effect and the current decreases with time as concentration polarization increases. All various homeopathic substances have distinct signatures.

The discontinuity at time zero should cause little concern. It is not predicted by more exact theory simply because this theory is predicated on the assumption of equilibrium at time zero. In most cases the current scan is started at potentials sufficiently anodic that the presence or absence of such a surge is a purely academic question. It would not be experimentally observed at these potentials even if present because it decays so rapidly. With initial potentials near E° such a surge is, in fact, observed.

LINEAR-CURRENT-SCAN CHRONOPOTENTIOMETRY

Although, to the author's knowledge, such a technique has not been reported in the literature, there is, at the stationary electrode, an obvious analog of conventional current-scan polarography. In this technique one would apply to the system a current varying linearly with time and observe the variation of electrode potential. Such a process would be represented by the intersection of the current-potential-time surface with the plane $i = at$, where a is the rate of

change of current with time. This intersection is shown in Figure D. The resultant curve has characteristics qualitatively similar to those of a constant-current chronopotentiogram. In this case K is given by the equation

$$K = 3nFC^\circ \sqrt{r^2 t} / 4 \quad (10)$$

If the transition time is defined by the equation

$$r^{3/2} = 3nFC^\circ \sqrt{D} / 4a \quad (11)$$

then the equation for the potential-time curve is

$$B = \ln \frac{a}{a - r t}$$

The correctness of this theoretical equation is substantiated by rigorous calculation based on the Fick equations of diffusion (4).

"NORMALIZED" CHRONOPOTENTIOMETRY

Equation 1 suggests that, if a current which increased with the square root of time were applied to a plane electrode, the resultant potential-time curve would be the strict analog of the potential-

see figure D.

current curve in conventional polarography. Rigorous calculation based on Fick's laws of diffusion bear out this contention (10). The process in this case can be represented by the inter-section of the surface of Figure B with the surface generated by the function $i = a\sqrt{t}$. The constant K is given by the equation

$$K = 2nFC^\circ \sqrt{D} / 4a \quad (13)$$

If the transition time is defined by the equation

$$r = 2nFC^\circ \sqrt{D} / 4a \quad (14)$$

the equation for the potential-time curve becomes

$$B = \ln \frac{a}{a - r t}$$

This is exactly the same as the equation for the conventional polarographic wave except that for i_d and i are substituted r and t , respectively. It is "normalized" in the sense that the transition time is directly proportional to the concentration rather than proportional to some power as in the constant-current and linear-current-scan techniques. Although the technique seems not to have been applied, it might find use in automatically controlled processes where a linear relationship between concentration and transition time would be desirable,

EXTENSION TO SPHERICAL ELECTRODES

The surface generated by Equation 1 is strictly applicable only to processes at a plane electrode. In most cases it also gives an excellent qualitative picture of the behavior at electrodes of other shapes. The spherical electrode is worthy of special note, however. In this particular case, the surface of Figure B can be modified by adding to the current at each potential the time -

independent quantity

$$= \frac{nFC^{\circ}D_0}{r(1 + \exp 0)}$$

where r is the radius of the electrode.

The modified surface predicts the theoretical behavior at constant potential voltammetry. For the conventional polarographic case it gives the Oldham-Kivalo-Laitinen modification (7) of the Heyrovsk'-Ilkovic equation. In view of the quantitative failure of the surface for polarography at a stationary plane, it is interesting to note that the spherical correction in this case is predicted accurately (9). For chronopotentiometry the modified surface is only of qualitative value. However, it does lead to the conclusion which is inherent in the rigorous calculations of Mamantov and Delahay (6) that if the applied current is made sufficiently small no transition will be observed. To obtain a chronopotentiogram, the applied current must be larger than the steady-state current on the cathodic plateau. This value is given

by the following equation. This equation defines one aspect of the process.

$$i = (nFC^{\circ}D_0) / r$$

$$i = nFC^{\circ}D_0/r \quad (18)$$

EXTENSION OF SURFACE TO HOMEOPATHIC SUBSTANCES

The preceding discussion has been limited to cathodic processes. It is evident that the same equations can be applied to anodic processes by merely changing the signs on the potential and current axes. Systems containing both the oxidized and reduced forms can be treated by modifying the denominator of the last term of Equation 1 to $i_{N}t - K'$ where K' has the same form as K but concentrations and diffusion coefficients therein are those of the reduced form. Although the surface deals specifically with the case in which both the oxidized and reduced forms are soluble, a similar surface can be drawn for the case of metal deposition. The equation for the surface in this case is

$$E = E^{\circ} - \frac{p}{n} \ln f_0 / 1/D_0 + \frac{RF}{n} \ln (K - iV/t) \quad (19)$$

For multicomponent systems, the model is simply constructed by adding currents separately calculated for each component at every time and potential. Our trivector homeopathic analysis has been using this voltammetric process and it is combined with an electropotential signature to combine to make a Quantum Quality Control process for the homeopathics. This was trademarked as the QQC process in 1989. And now has a world wide trademark. This QQC clearly shows the basis for the enhancement of the transition-time of a signature process caused by prior reaction of another in

chronopotentiometry.

Certain conditions do not obey the Nernst equation. It becomes then impossible to write a general equation of the form of Equation 1 and, therefore, such systems cannot be represented quantitatively by a single surface. Qualitatively, however, such a surface would resemble that of Figure B with three modifications. First, the surface would intersect the time zero plane along an exponentially rising curve rather than approaching it asymptotically. Second, the rise to the diffusion plateau with cathodically increasing potential would not be as steep as in the present case. Third, the decay of current with time would be much slower at the base of the diffusion plateau. Thus the electropotential variance signature (covered in a support article) allows a support to give us a more reliable reading when the Nernst equations does not apply.

! Trivector QQC as the basis of ELECTRO ANALYTICAL CHEMISTRY

CONCLUSIONS

Homeopathy uses the polar structure of water and its liquid crystal structure to provide a shape transfer. The shape receptors of the nasopharynx is the sight of the homeopathic information transfer.

The potential-current-time surface with its associated equation gives excellent qualitative and in most cases quantitative agreement with more rigorous treatments for various voltammetric techniques. It has proven useful in the evaluation of, proposed new techniques for homeopathic analysis of shape or topological energetic signature.

Moreover, experience indicates that it is a valuable quality control process for homeopathic analysis. The fundamental similarities among various voltammetric processes as well as their differences become apparent with the aid of the shape retention phenomena of the polar structure of water. Together with a conductive, magnetic, and capacitance resonance or trivector, a very eloquent homeopathic analysis can be achieved.

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Figure A.

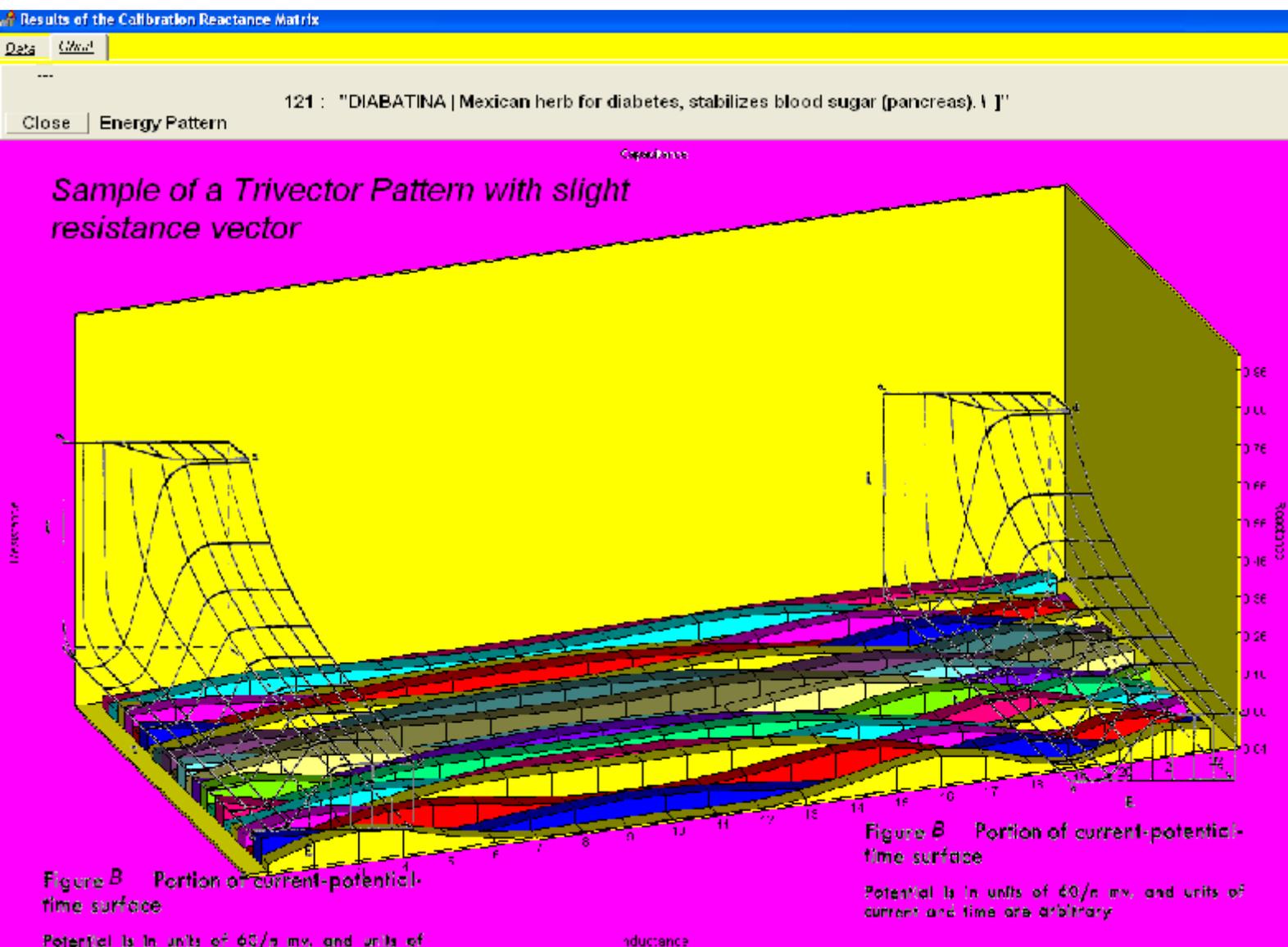


Figure B1. Portion of current-potential time surface
Figure B2. Geometrical representation of polarography at a stationary electrode

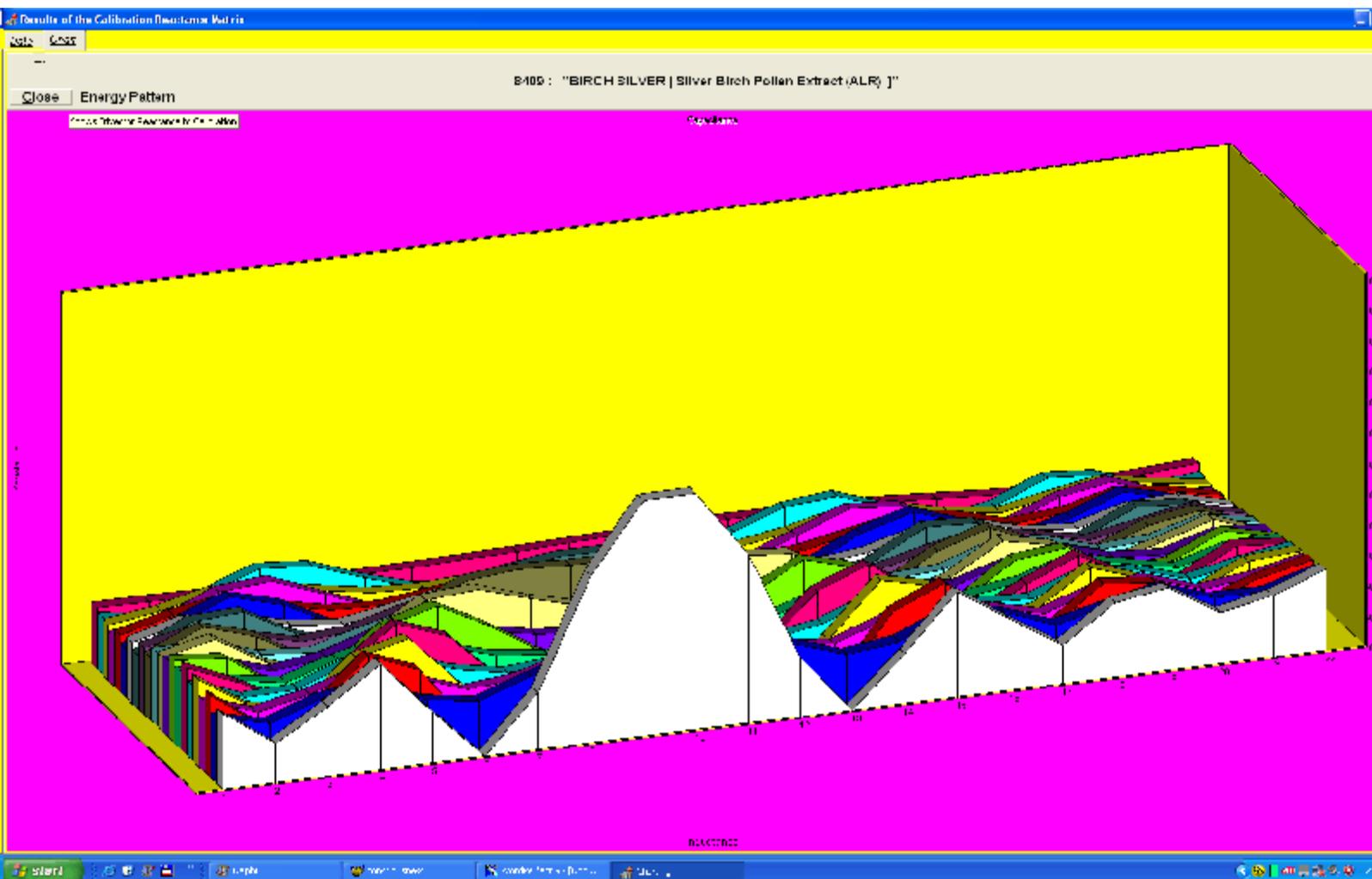


Figure C. Geometrical representation of current-scan trivector QQC chronopotentiometry

