

UNIVERSITY OF PRETORIA  
UNIVERSITEIT VAN PRETORIA

**DEPARTMENT OF CHEMISTRY  
DEPARTEMENT CHEMIE**

**INAUGURAL ADDRESS OF  
INTREEREDE VAN**

**PROF IGNACY CUKROWSKI**

Head: Department of Chemistry / Hoof: Departement Chemie

**Title: Virtual Thermodynamic Potential  
Titel: "Virtuele Termodinamiese Potensiaal"**

**Date/Datum:** 2005-07-28  
**Time/Tyd:** 18:00 for/vir 18:30  
**Venue/Lokaal:** Senate Hall/Senaatsaal  
**Enquiries/Navrae:** Annatjie Kok  
(012) 420-3772

Sherry on arrival at 18:00.

Light refreshments will be served after the inaugural address.

Sjerrie by aankoms om 18:00.

Ligte verversings sal bedien word na die intreerede.

# Virtual Thermodynamic Potential

Electrochemistry started from the development of new sources of energy by Volta two hundred years ago. Still today this is most urgent problem to solve for our civilisation to survive. Theory of electrolysis, production of new materials with well-defined properties by use of electricity, was developed by Faraday about 150 years ago. It is practiced on large industrial scale all over the world and the development of new materials with well-defined properties is still of highest priority to us. The above represents kinetics, dynamic physical and electrochemical processes.

Why we are still struggling with new sources of energy today? One can blame Nernst for that whose thermodynamic ideas dominated science for over a century. Till today we have two streams of activities in Physical Chemistry, thermodynamics and kinetics. They seem to have no obvious link and are discussed in separate chapters in the textbooks.

New concept of virtual potential will be presented and some of its applications presented. VP is a result of mathematical transformation of kinetic, non-equilibrium data into type of data the Nernst equation (thermodynamics, equilibrium chemistry) can handle. VP is the first and mathematically described link in electrochemistry between thermodynamics and kinetics.

## Virtuele Termodinamiese Potensiaal

Elektrochemie het ontstaan uit die ontwikkeling van nuwe energiebronne deur Volta tweehonderd jaar gelede. Vandag is dit steeds die dringendste probleem om op te los met die oog op die oorlewing van ons beskawing. Die teorie van elektrolise, die produksie van nuwe materiale met goed omskrewe eienskappe deur elektrisiteit te gebruik, is ongeveer 150 jaar gelede deur Faraday ontwikkel. Dit word wêreldwyd op groot skaal in die nywerheid gebruik, en die ontwikkeling van nuwe materiale met goed omskrewe eienskappe is steeds vir ons van die uiterste belang. Die voorgaande behels kinetiese, dinamiese fisiese en elektrochemiese prosesse.

Waarom worstel ons vandag steeds met nuwe energiebronne? Dit kan aan Nernst toegeskryf word, wie se idees oor termodinamika die wetenskap langer as 'n eeu oorheers het. Vandag nog het ons twee strome aktiwiteite in Fisiese Chemie, naamlik termodinamika en kinetika. Daar is geen voor die hand liggende skakels tussen die twee nie, en hulle word in die handboeke in afsonderlike hoofstukke bespreek.

'n Nuwe konsep van virtuele potensiaal (VP) en party van die toepassings daarvan sal aangebied word. VP is 'n gevolg van die wiskundige transformasie van kinetiese, nie-ewewigsdata tot 'n tipe data wat die Nernst-vergelyking (termodinamika, ewewigschemie) kan hanteer. VP is die eerste wiskundig beskrywende skakel in elektrochemie tussen termodinamika en kinetika.