PM-90e Series Pump

BAS introduces the new PM-90e family of pumps. The PM-91e is a single piston pump, and the PM-92e is a dual piston model designed specifically for the most demanding microbore liquid chromatography experiments. The PM-92e is incorporated into the new BAS 200e liquid chromatography system. Both pumps are also components in a variety of additional new BAS epsilon Chromatographs.

- Ideally suited for use with the BAS Pollen-8 on-line injector, they can also be used in column switching experiments with BAS BioTrap sample prep cartridges.
- Small and lightweight, they are conveniently stacked in areas where space is limited. Applications include flow injection analysis (FIA), hydrodynamic electrochemistry, as well as LC experiments.
- Microprocessor-controlled piston drives eliminate pulses and provide a consistent stable flow regardless of changes in solvent compressibility and system back pressure.
- Sensors monitor pressure within each individual head and continuously compare 'in-head' pressure to system back pressure.
- The PM-92e dual piston pump uses feedback from the pressure sensors to independently control each piston drive in order to synchronize the crossover of delivery from one piston to the other, providing stable, continuous flow.
- The PM-91e single piston pump takes a 'snapshot' of the system pressure just prior to refilling. The pump then rapidly refills and quickly pressurizes the solvent to the 'snapshot' pressure before resuming delivery at the commanded flow rate. This procedure minimizes the interruption of solvent flow during refill. A pulse damper further minimizes pump flow fluctuations.
- Imbedded software control automatically compensates for solvent compressibility and even gas bubbles retained in the pump, to deliver pulse-free operation. This design works particularly well for high-sensitivity, low flow rate microbore and LC/MS applications.
- A high efficiency microstepping motor driven ballscrew provides precise control of piston motion.
- Floating piston design reduces side loading on seals for prolonged seal life.
- Wash ports are provided for rinsing precipitated buffers from seals and pistons. Front access provides easy detection of leaks, and removable heads retain the sapphire piston for easy maintenance of seals and pistons.
- Low system volume allows quick solvent changeover and fast equilibration for microbore applications.
- Programmable either using front panel controls, or through BAS Chromgraph-e, the new version of our popular Chromgraph software (now available for epsilon instrument systems).

Simple front panel operation - enter flow rate, upper and lower pressure limits and go!

PM-90e Series Pump

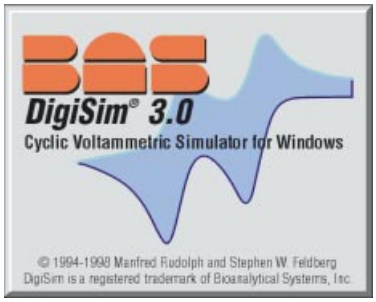
BAS Develops Improved Rotating Disk Electrode

BAS developed the RDE-2, a miniature rotator system for use in constant-RPM and hydrodynamic modulation rotating disk electrochemistry. With the BAS RDE-2 (EF-1100), users can also conduct stationary electrode experiments with the electrode material of choice. The new electrode firmly holds all the components of the electrochemical cell (vial, electrodes, and top) while providing electrode rotation speed in the range of 50-10,000 RPM. Built-in gas control allows purging of blanketing of the sample prior to or during experiments. The rotator assembly is easily inverted for polymer spin coating directly on the unit, and the spin-coat adapter provided prevents splashing of coating material. The RDE-2 interfaces directly with BAS 100 series, BAS CV-50W and new epsilon electrochemical analyzers. The package includes everything necessary to conduct experiments with a glassy carbon working electrode.

RDE-2, Rotating Disk Electrode

BAS Announces Latest Version of Simulation Software

BAS announces the latest version of the DigiSim® simulation software for cyclic voltammetry. DigiSim 3.0 has been optimized for Windows 95 and 98, and is based on a multiple document interface. The user-specified mechanisms can contain single or multiple electron transfer reactions and first- or second-order chemical reactions under semi-infinite diffusion, finite diffusion, or hydrodynamic conditions. Dynamic concentration profiles can be viewed using CV - the Movie™, and the simulation parameter values can be optimized to generate the best fit to experimental data. For more information, visit the BAS web site at *www.bioanalytical.com.*



DigiSim Simulator

Nuevo Producto: EPSILON

Introduciendo el Analizador Electroquímico EPSILON

El modelo e2 es el único instrumento electroanalítico en el mercado que puede hacer técnicas de potencial y corriente controladas y potenciometría en un solo equipo. El instrumento básico incluye los componentes y la interfase Windows para hacer Voltametría Cíclica (Barrido Lineal), Electrólisis de Potencial Controlado (Coulombimetría), Cronoamperometría/Cronocoulometría, Cronopotenciometría, Equilibrio de Potencial Contra Tiempo y Amperometría DC. El instrumento básico puede ser "upgraded" para llevar a cabo experimentos de multi-electrodos (bi- y quad-potenciostato) y/o añadir nuevas técnicas. Todos los "upgrades" de técnicas pueden ser comprados y entregados a través de la Internet. Como el e2 puede ser controlado a través de la web, también se le puede dar servicio por ese mismo medio. Este instrumento puede ser fácilmente acoplado a varios accessorios para expander sus capacidades analíticas. Entre dicho accesorios se encuentran: bombas de alta capacidad, automuestreadores, celdas de flujos multi-electrodos, "cell stands" y otros. Para informacion más reciente, ver: *www.epsilon-web.net*

epsilon Instrument

In the EC Literature

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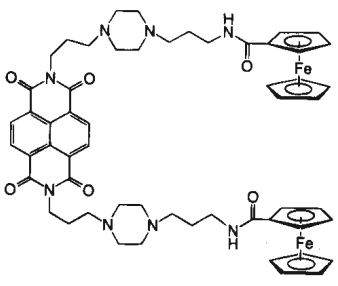
♦ DNA Sensing on a DNA Probe-Modified Electrode Using Ferrocenylnaphthalene Diimide as the Electrochemically Active Ligand

S. Takenaka, K. Yamashita, M. Takagi, Y. Uto, and H. Kondo, Anal. Chem. 72 (2000) 1334-1341.



Although electrochemical methods for concentration determinations can be sensitive with low detection limits, they typically lack in selectivity. In order to compensate for this, electrochemical methods have been combined with biological molecular recognition processes (e.g., enzyme/substrate interactions) which have high inherent selectivity. Another molecular recognition process that has been exploited is the hybridization of single stranded DNA immobilized on the surface of an electrode with its complementary sequence in solution, followed by the electrochemical detection of the double stranded DNA using a redox-active probe that binds to the double stranded DNA. This paper reported the characterization of the redox probe ferrocenylnaphthalene (see above figure), and it was shown by cyclic and differential pulse voltammetries (run using a CV-50W) that the interaction of this probe with double stranded DNA was much more kinetically and thermodynamically favorable than it was with single stranded DNA. This was illustrated for both artificial (e.g., a sample containing only one type of nucleotide) and natural DNA samples, and detection limits down to fmol were reported. However, it was observed that the experiments in this study involved only complementary DNA sequences with no mismatches. In order to be practical, any method for identifying DNA sequences must also be able to discriminate against sequences with mismatches, and this will be the subject of further studies.

♦ Electrochemical Studies of the Intercalation of Ethidium Bromide to DNA

T.-C. Tang and H.-J. Huang, Electroanalysis 11 (1999) 1185-1190.

The intercalation of ethidium bromide with DNA has been much studied. These studies are typically based on the fluorescence characteristics of ethidium bromide. In this study, the intercalation of ethidium bromide into DNA was investigated electrochemically using a BAS 100B. It was shown that reproducible results for the oxidation of ethidium bromide at a glassy carbon electrode could be obtained following an electrode pretreatment (anodic polarization in 0.5 M sodium hydroxide). The concentration of free ethidium bromide following incubation with double-stranded (ds) DNA could be measured, and hence the equilibrium constant for the intercalation could be calculated. The values calculated from these measurement agreed well with previously published data. These measurements were also used as the basis of a method for the measurement of dsDNA concentrations. A detection limit of 0.4 µM and a linear range of 0.4 - 107 µM was found under ideal conditions.

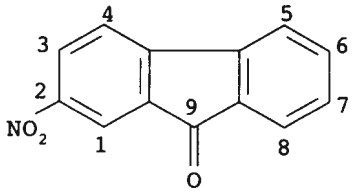
♦ Ferredoxin-Mediated Electrocatalytic Dehalogenation of Haloalkanes by Cyctochrome $P450_{cam}$

M.Wirtz, J. Klucik, and M. Rivera, J. Am. Chem. Soc. 122 (2000) 1047-1056

The catalytic capabilities of cytochrome P450 enzymes for a variety of substrates have prompted the investigation of their potential for use in bioremediation. For example, cytochrome $P450_{cam}$ can be used for the *in vitro* reductive dehalogenation of haloalkanes. However, one disadvantage of using cytochrome $P450_{cam}$ for this process has been that the required reducing equivalents have been delivered using NADH and two other proteins, which are all expensive and fragile. This study reported a more robust approach based on transfer of electrons from an indium tin oxide (ITO) electrode to the cytochrome $P450_{cam}$ using spinach ferredoxin as a mediator. The ITO electrode was modified with polylysine, which promoted electron transfer to the ferredoxin while discriminating against the cytochrome $P450_{cam}$. The electrocatalytic mechanism was investigated by cyclic voltammetry using a CV-50W to run the experiments, and the digital simulation software DigiSim® to interpret the data. The results of these experiments were consistent with the proposed mediated electron transfer mechanism.

♦ Immobilized Nitro-fluorene Derivatives as Electrocatalysts for NADH Oxidation

N. Mano and A. Kuhn, J. Electroanal. Chem. 477 (1999) 79-88.



NADH is a cofactor in many dehydrogenase enzymes, and the oxidation of NADH is an integral part of the catalytic cycle. However, there is a large overpotential for the oxidation NADH on bare electrode surfaces such as carbon and gold, and hence mediators are used for the oxidation of NADH in biosensors based on dehydrogenase enzymes. In this study, the redox behavior of a number of nitro derivatives of fluorenone was studied (see above figure), along with their ability to act as mediators for the oxidation of NADH. It was shown that there was no electrocatalytic activity for mono-substituted fluorenone. However, for derivatives with two or three nitro groups, significant electrocatalytic activity was observed, based on the reaction of NADH with the hydroxylamine generated by the reduction of a nitro group. It was proposed that the electrocatalytic activity required both a hydroxlamine group and a nitro group in the same molecule, with the nitro group providing stabilization of the hydroxylamine group through delocalization. The rate constant for the reaction between the substrate and the electrocatalyst was measured by hydrodynamic voltammetry using a BAS 100B and a RDE-1 rotating disk electrode.

♦ Electrocatalytic Reduction of H_2O_2 at $P_2Mo_{18}O_{62}^{6-}$ Modified Glassy Carbon Electrode

D. Martel and A. Kuhn, Electrochim. Acta 45 (2000) 1829-1836.

The detection of hydrogen peroxide generated by a range of enzymes (e.g., oxidases) is an essential component of many biosensors, and a variety of electrocatalysts (e.g., peroxidases, transition metals) have been used for this purpose. Polyoxometalates are also known as electrocatalysts, and in this study the ability of the polyoxometalate $P_2Mo_{18}O_{62}^{6-}$ to act as an electrocatalyst for the reduction of hydrogen peroxide was investigated by cyclic voltammetry using a BAS 100B. It was found that reduction of hydrogen peroxide occurred at a significantly reduced overpotential (compared with other electrocatalysts) with the polyoxometalate either in solution or immobilized on the surface of a glassy carbon electrode (both as a monolayer and as a bilayer). However, the rate of the catalytic reaction was not fast enough for this electrocatalyst to be useful as part of a biosensor.

♦ Bioelectrochemical Characterization of Cellobiose Dehydrogenase Modified Graphite Electrodes: Ionic Strengths and pH Dependences

T. Larsson, A. Lindgren, T. Ruzgas, S.-E. Lindquist, and L. Gorton, J. Electroanal. Chem. 482 (2000) 1-10.

Enzyme-based biosensors have become a widely used method for the electrochemical detection of physiologically important species (e.g., glucose). However, in order to optimize the response of such biosensors, the fundamental processes that occur in the enzyme reaction must be understood. This study is one in a series of papers reporting the characterization of biosensors based on cellobiose dehydrogenase, which oxidizes cellobiose and lactose. This enzyme contains two cofactors; one FAD group and one heme group. The enzyme was adsorbed to the surface of a graphite electrode, and the current response to lactose and cellobiose as a function of pH and ionic strength was examined by steady-state amperometry and slow scan cyclic voltammetry using a BAS 100B/W. The results were consistent with a mechanism in which the substrate was oxidized by the FAD group, and the resulting $FADH_2$ was oxidized by the sequential transfer of two electrons to the electrode using the heme group as the mediator (i.e., there was direct electron transfer between heme group and the electrode).

In the MD Literature

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♦ Determination of Catecholamines in Pheochromocytoma Cell (PC-12) Culture Medium by Microdialsyis-Microbore Liquid Chromatography

F-C Cheng, J-S Kuo, H-M Huang, D-Y Yang, F-F Wu, T-H Tsai. J. Chromatography A, 870, 405-4111, 2000.

Most microdialysis studies are carried out in vivo. However, many of the same advantages microdialysis brings in vivo studies may also apply to in vitro studies. In this study, Cheng et. al. utilized in vitro microdialysis to examine the release of catecholamines from pheochromocytoma (PC-12) cell cultures. In vitro microdialysis sampling was directly coupled to microbore liquid chromatography via an on-line injector.

The group found that they were indeed able to sample catecholamines from the PC-12 incubation media, and that this approach enabled them to overcome several common obstacles encountered when analyzing culture media. First, this approach eliminated the need to centrifuge the culture system to collect the culture medium. Second, the pretreatments usually required were not necessary. Third, they were able to robustly separate and quantitate the very low levels of analyte present in the culture medium. And forth, they were able to repeatedly sample from the same culture, even after manipulations, which would have been precluded by the need to centrifuge noted in the first item. The authors note that "[this approach] is relatively efficient, cost-effective, and less vulnerable to human error as compared with conventional studies in which a number of Petri dishes are used."

♦ A role of Glutamate in Drug-Induced Ototoxicity: In Vivo Microdialysis Study Combined with On-Line Enzyme Fluorometric Detection of Glutamate in the Guinea Pig Cochlea

K. Matsuda, S. Komune, T. Tono, M. Yamasaki, A. Haruta, E. Kato. Brain Research, 852, 492-495, 2000.

Glutamate is suspected to be the primary amino acid transmitter at synapses between the cochlear hair cells and spiral ganglion neurons. In excess, glutamate is thought to be a neurotoxic consequence of cochlear damage. Previous studies have observed elevated glutamate in the perilymph after such damage.

Some drugs, in addition to noise trauma, cause damage to inner ear hair cells. The aminoglycosides kanamycin, and ethacrynic acid are two such drugs. However, there have been no reported observations of perilymphatic glutamate efflux in response to these, or other such drugs. The purpose of this study was to determine if kanamycin, and ethacrynic acid cause glutamate efflux, and if so, examine its time course and any subsequent morphological changes.

A microdialysis probe was inserted into a small hole drilled into the scala tympani. The area around this probe insertion hole was sealed with dental wax to prevent perilymph leakage. Following a stabilization and baseline period, the authors administered the kanamycin and/or ethacrynic acid treatments and monitored glutamate for four hours via flow-injection fluorescence detection. Ninety to 150 minutes after treatment with both kanamycin and ethacrynic acid, but not either alone, perilymphatic glutamate increased at least 11 fold, and remained elevated throughout the observation period. The histological findings complimented the neurochemical ones; there was marked hair cell damage in animals treated with both drugs, but little or no damage in untreated or single drug treated animals. The authors suggest that glutamate may be an important component in the loss of hair cells and spiral ganglion cells following administration of such drugs.

♦ EIS 2001 Symposium

The 5th Edition of the International Symposium on Impedance Spectroscopy (EIS 2001), previously held in Bombannes 89, St Barbara 92, Ysermonde 95, Angra dos Reis 98, will be held in Marilleva (Trento), Italy, on 17th -22nd June 2001. The main purpose of the conference is to congregate scientists, users and suppliers of the impedance technique. The Symposium will focus on understanding and discussing the applications of electrochemical impedance, on the study of a wide variety of subjects, such as, among others, corrosion and electrodeposition processes, electrochermical kinetics, electronic and ionic conducting polymers, semiconducting electrodes, batteries and fuel cells.

Both the Advisory Board and the Local Committee will work hard at continuing the tradition of successful EIS Symposia, and we look forward to hosting original contributions in the form of either lectures or posters concerning electrochemical impedance spectroscopy.

Contributions related to industrial applications of EIS will be welcome. Upon agreement with the Editor of Electrochimica Acta, a special issue will contain selected and reviewed papers from EIS 2001.

Marilleva is located 60 km north of Trento in the mountains, in the Brenta Dolomites and the Stelvio National Park. Airports are located in Verona (90 Km south of Trento) and Bolzano (50 Km north of Trento) linked with Paris, London, Frankfurt, Rome, Milan, Vienna, etc.); trains to Trento are available from Milan (220Km), Rome (450Km), Munich (400Km), Venice (150Km), and Innsbruck (180Km). Bus connections from Trento to Marilleva will be organised.

The Province of Trento is rich in natural beauties, mountains, lakes, parks, monuments and castles, good food and excellent wines.

We are trying to make available tours to Venice, Mantova, Verona, lake Garda, the Dolomites... A banquet in a middle ages castle, a visit to a wine factory of world-wide reputation are foreseen. See you in Marilleva EIS 2001!

Advisory Board

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Local Organizing Committee

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Lorenzo Fedrizzi
Flavio Deflorian
Stefano Rossi

Important Dates

Summer 2000 : second circular
January 31, 2001: submission of abstracts
February 28, 2001: acceptance of abstracts
April 30, 2001: final Programme
June 17, 2001: Start of Symposium, submission of full papers

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♦ Gordon Conference: Chemical Sensors and Interfacial Design

The fourth Gordon Research Conference on Chemical Sensors and Interfacial Design will be held at the Il Ciocco Resort, Barga, Italy, May 6-11, 2001.

We look forward to this event in its new and scenic venue. The conference site is nestled in the Tuscany region of Italy, in close proximity to Lucca, Pisa and Florence.

As you know, Gordon Conferences are traditionally smaller meetings, providing ample opportunities for conferees to communicate with each other and with the speakers.

Historically, CS&ID has been an exciting and diverse meeting. We are in the process of formulating a program that will hopefully live up to the standards set by the organizers of the first three CS&ID Conferences. As you can imagine, this is a difficult job. We would therefore welcome any suggestions you have for topics, speakers, and discussion leaders.

Even more importantly, we want to encourage your participation in the Conference. In addition to the scheduled talks, we will hold poster sessions that will be open to all participants. There will also be an opportunity for younger scientists in the field to present their work in shorter talks at one of the evening sessions. We are also making every effort to find support for students, postdocs, and young scientists who wish to present their work at the Conference.

You may also consult the Gordon Research Conference website at *www.grc.uri.edu*, for further information about the conference as it develops, and for an on-line application at *www.grc.uri.edu/attend.htm*.

We look forward to seeing you in Italy in Spring ‘01!