NATIONAL WORKSHOP

ON

UNIVERSITY - INDUSTRY INTERACTIONS IN CHEMISTRY

25 - 26 MAY 1984

AT THE

NARESA AUDITORIUM,
47/5, MAITLAND PLACE,
COLOMBO 7.

PROGRAMME

25 May, 1984

9.00	INAUGURATION	:	Dr. F.S.C.P. Kalpage, Chairman, UGC and Nat. Comm. for Univ. Ind. Interactions in Chemistry

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SESSION I - RESOURCES DEVELOPMENT
CHAIRMAN : Dr. F.S.C.P. Kalpage

9.15	'Resource Development'	:	Mr. C.S. de Saram, International Executive Service Corps.
9.40	'Prospects of Upgrading Industrial Minerals of Sri Lanka'	:	Dr. M.G.M.U. Ismail, C.I.S.I.R.
10.00	'Possibilities of resource development in the salt industry'	:	Mr. S.A.S. Perera, Sri Lanka National Salt Corporation.
10.20	TEA		
10.45	'Greater conversion of raw rubber into finished products'	:	Mr. H.S.M. Pieris, Hettiarachchi & Co. Ltd.
11.15	'Use of dolomite as a finishing coat in masonry'	:	Dr. H.D. Gunawardhana, University of Colombo
11.45 - 12.15	Discussion		
12.15	LUNCH		

SESSION II - ORIENTATION OF UNIVERSITY PROGRAMMES FOR INDUSTRY
CHAIRMAN : Prof. R.S. Ramakrishna

2.00	Introduction		
2.15	'Education and Training of Chemists for Industry'	:	Prof. R.H. Wijayanayake, University of Ruhuna
2.45	'Strengthening the bond between theory and practice'	:	Dr. E.R. Janes, C.I.S.I.R.
3.15	TEA		
3.45	'What kind of Interaction'?	:	Dr. A.M. Abeysekera, University of Sri Jayewardenepura
4.00 - 4.30	Discussion		

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SESSION III - PROBLEM SOLVING IN CHEMICAL INDUSTRY
CHAIRMAN : Prof. M. Selvaratnam

9.00	Introduction		
9.15	'The activated carbon industry'	:	Mr. R. Yatawara, Haycarb Ltd.
9.45	'The University of Kelaniya experience'	:	Dr. S. Kumarasinghe, University of Kelaniya.
10.15	TEA		
10.45	'Water treatment in the Textile Industry'	:	Mr. Lal de Mel, C.I.C. Ltd.

11.15	'Reduction of Chlorate contaminant in the chloralkali industry in Sri Lanka'	:	Dr. J.N.O. Fernando University of Colombo (presented by Mr. D. Jayamanne)
11.45 - 12.15	Discussion		
12.15	LUNCH		

SESSION IV - DISSEMINATION OF INFORMATION AND STRATEGIES FOR INTERACTION

CHAIRMAN : Dr. E.R. Jansz

2.00	'Strategies for interaction'	:	Prof. R.P. Gunawardena University of Peradeniya
2.20	'Role of the C.I.S.I.R. in University Industry Interaction in Chemistry'	:	Miss C.L.M. Nethsingha C.I.S.I.R.
2.40	'Transfer of scientific and Technical Information'	:	Mr. N.U. Yapa, NARESA.
3.00	TEA		
3.30	'Dissemination of Information - Role of IDB'	:	Mrs. G. Abeydeera, I.D.B.
3.50	Discussion		
4.20	Resume	:	Prof. R.S. Ramakrishna, University of Colombo

RAPPORTEURS:

SESSION I	:	RESOURCES DEVELOPMENT - MISS C.L.M. NETHSINGHE
SESSION II	:	ORIENTATION OF UNIVERSITY PROGRAMMES FOR INDUSTRY - DR. R. MAGESWARAN
SESSION III	:	PROBLEM SOLVING IN CHEMICAL INDUSTRY - DR. J.S.H.Q. PERERA
SESSION IV	:	DISSEMINATION OF INFORMATION AND STRATEGIES FOR INTERACTION - DR. A. BAMUNUARACHCHI

WORKSHOP CO-ORDINATION : PROF. R.S. RAMAKRISHNA

ABSTRACTS OF WORKING PAPERS

RESOURCES DEVELOPMENT 25 May 1984, 9.00-12.15

'Resource Development'
C.S. de Saram
International Executive Service Corps.

The problems experienced by entrepreneurs in developing resources is reviewed, together with the various stages of the process by which a particular raw material is identified and developed into a commercially viable process.

The review is based entirely on the development of a local raw material for the Sri Lanka market, on the basis that once the process has been proved, export markets can be sought and developed.

An example of such a project from identification of raw material to finished product is examined.

'Prospects of Upgrading Industrial Minerals of Sri Lanka'

M.G.M.U. Ismail
C.I.S.I.R.

In Sri Lanka no economic deposits of base metals (lead and zinc) and precious metals (gold, silver, platinum) were found. The exploitable deposits of minerals containing light metals like magnesium and titanium occur as dolomite (or magnesite) and rutile (or ilmenite) respectively.

Ilmenite and rutile are the two main principal sources used for the production of titanium metals and its compounds. Concentrated deposits of ilmenite occur in beach sand with rutile, zircon and monazite at Pulmoddai, North of Trincomalee. The Pulmoddai deposit is about 4 miles in length with an average width of 200 feet. The ilmenite content in the raw beach sand is about 70 - 72% and with an average of 53% TiO_2.

Pulmoddai plant produces about 85,000 tons of ilmenite annually and it is exported without any further processing for synthetic rutile and pigment manufacturer .

The experiments carried out here showed, that the ilmenite containing about 53% TiO_2 could be converted to synthetic rutile containing minimum of 95% TiO_2 by oxidation-reduction-leach process. The product obtained can be used directly for the production of Ti metal and TiO_2 pigment by the chloride process.

Work carried out on the beneficiation of Eppawela Apatite and purification of crystalline limestone will also be discussed.

'Possibilities of resource development in the salt industry'

S.A.S. Perera
Sri Lanka National Salt Corporation

The paper describes production of common salt in the coastal salt works of Sri Lanka. Aspects of development regards manufacture of gypsum, epsom salt, schoenite, magnesia which have resulted from the research division of the corporation are outlined.

'Greater conversion of raw rubber into finished products'

H.S.M. Pieris
Hettiarachchi & Co. Ltd.

In 1982, about 132 million kg. of natural rubber was exported in its raw form fetching Rs. 2.3 Billion. The exports of rubber based finished products amounted to only a fraction of this figure, and surprisingly double this value of rubber products was imported to Sri Lanka. An analysis of exports classified into product groups, indicates a sharp variation in profitability. Conversion of natural rubber into various forms of exportable items should therefore be carefully planned.

The finished product rubber industries still continue to be highly biased towards the tyre industry, servicing domestic needs. A greater conversion of raw rubber into finished goods should necessarily be governed by adding value to the material. Availability of natural rubber below world market prices, intelligent and skilled manpower, cheap labour, privileged access to many foreign markets and tax incentives create an ideal manufacturing base in Sri Lanka.

'Use of dolomite as a finishing coat in masonry'

H.D. Gunawardhana
University of Colombo

The major drawback in the application of dolomite as a substitute for limestone is the appearance of cracks when calcined and subsequently slaked dolomitic quick lime is applied on the plaster in the form of a finishing coat. Investigations into the cause for the appearance of cracks have revealed that there are five major factors which influence the appearance of cracks. Out of the factors identified, more extensive studies were carried out on factors such as moisture content of the plaster and the percentage of carbon dioxide of dolomitic quick lime. The optimum conditions for the application of dolomite as a finishing coat without the appearance of cracks have been recommended. The appearance of cracks can be mitigated by achieving complete slaking of magnesium oxide component before the slaked calcium oxide is set. Pilot scale application of dolomite under recommended conditions revealed promising results. This paper describes a successful attempt to use dolomite limestone as a substitute for coral limestone, especially in the application of finishing coat in masonry.

ORIENTATION OF UNIVERSITY PROGRAMMES FOR INDUSTRY

25 May, 1984 , 2.00 - 4.30 p.m.

'Orientation of University Programmes for Industry'

R.S. Ramakrishna
University of Colombo

Orientation of curricula and diversification of university programmes in chemistry, are essential to meet the growing challenges of local industry.

Universities should no doubt be nurtured on Research and provide academic growth and Training, to meet national needs and for the exploitation of our resources. Service to industry and the community, is an essential component of such programmes.

Some thoughts on orientation of University programmes in chemistry will be suggested.

'Education and Training of Chemists for Industry'

R.H. Wijayanayake
University of Ruhuna

'Strengthening the bond between theory and practice'

E.R. Jansz
C.I.S.I.R.

In order that a significant interaction between Universities and Industries can be achieved, certain basic requirements must be first fulfilled. Firstly, from the University end, a pool of expertise should be built up equal to understanding the complex problems of Industry-this will require at least a few senior academics devoting a considerable part of their time towards this purpose. Secondly, an increased awareness should be built up in industry that the application of the principles of chemistry and the ever widening scope of chemistry could be gainfully employed in industry. This latter aspect may require the organisation of workshops, seminars and perhaps even refresher courses for the R and D personnel in industry.

There also may be a case for exchange of personnel (if not between University and Industry, then between University and Research organisations) for short periods of time, in order to promote understanding and forge links in communication between the seat of learning and sites of production.

Other mechanism that may need to be explored are changes in curriculum in University courses, both at undergraduate and postgraduate level, with the idea of promoting interaction between University and Industry, by expanding existing programmes for students such as industrial training, applied chemistry final year projects, industrial visits etc.

'What kind of Interaction?'

A.M. Abeysekera
University of Sri Jayewardenepura

The goals of the Universities and the Industry are ostensibly different. However, a mutually beneficial interaction is possible, but only under favourable socio-economic circumstances.

PROBLEM SOLVING IN CHEMICAL INDUSTRY. 26 May 1984, 9.00 - 12.15

'The activated carbon industry'

R. Yatawara
Haycarb Ltd.

Haycarb is a quoted Public Company with over 350 local Shareholders, and is a subsidiary of Hayleys. It manufactures activated Carbon for export, consuming about 1/3rd. of the 30,000-tonnes of coconut shell charcoal which has been exported from Sri Lanka annually for decades. The Project was embarked upon in 1973 with a capital of Rs. million and two Executives, more as a proto-type Venture, on the rationale that it was logical to add value to an export product, and if the processing technology could be mastered, all else would fit into place. The established, internationally reputed producers of Activated Carbon declined invitations for a Collaboration Venture. Being mainly proprietary technology, unavailable on library shelves or licensing markets, our last and only avenue was to accept an offer of technical consultancy for £ 5000 by an octogenarian individual who had been in the industry many decades previous - and who constantly warned us of what we were up against and bade us abandon it.

The ensuing years entailed relentless efforts, on our own, in uprating Plant and Process and Laboratory facilities and product knowledge, to diversify type and improve product quality economically to the varied standards of international customers. It has helped us to secure a foothold in the very limited, highly competitive sector of the market, where quality, price and reliability of supply only matter. Our survival and growth, however, depend totally on our ability to match the high technology adsorption engineering capability and market presence all our multinational competitors possess. These include -

- Total systems supply, i.e. customer problem identification, R+D, equipment design, Carbon selection, equipment fabrication/installation, and even management.
- International reputation acquired over decades,
- No customer 'bias' about high technology product from third world source,
- Full spectrum of Carbon types to suit application (coal, wood, etc.)
- Physical presence in marketplace (Europe, USA, Japan), market awareness, prompt supplies, reactivation services spent Carbon, technical salesmen, research labs, warehouses, close customer contact.
- Amortised investment on automated processes
- Low energy costs in manufacture,
- Captive Government Contracts for supplies, especially military and nuclear,
- Accumulated application oriented data of past,
- Multiplicity of specialised research laboratories to access,
- Off-the-shelf equipment and chemicals availability (new and used), for Plant, specialised repair services, lab or application R+D,
- Freedom from exchange, export/import control regulations to expedite servicing international business,
- Multi options of packaging and delivery services,
- Customer credit and control ease.

The establishment of Sorb-Tech. Inc., Texas, USA, a Joint Venture marketing Company, as a springboard for enhancing front end capability, was the first step, accompanied also by technical advancement of Agency Distributors in other territories. This has to be accompanied by intensive research and development at an accelerated pace, at home, to accomplish following -

- mastery over process control in critical areas,
- product quality improvement,
- product treatment and type diversification for value addition,
- equip to perform all international standard Carbon testing procedures,
- generate and publish standard empirical data on properties of various grades,

- produce sales literature on various Carbons' performance at individual application parameters,
- equip selves to conduct specific user oriented research on pilot scale.

The complexity of these exercises may be assessed from the undernoted :

1. the myriad uses of Activated Carbon, as depicted here- this requires some knowledge in varied disciplines,
2. patents covering various treatments/procedures, etc., are not what are being commercially practised for economic and proprietary reasons,
3. instrumentation and equipment needed, for brief periods or 'one off' usage, is of a sophisticated, costly nature though, of necessity, must be rapidly accessible for co-relation to treatment methods,
4. toxic or high value chemicals, locally unavailable and not easily imported, are involved,
5. no access to more appropriately equipped users' labs,
6. The activation reaction, which determines the pore size distribution of the Carbon, is not an easy one to control,
7. limited product evaluation involves at least 8-12 tests over 24-hrs.

'The University of Kelaniya Experience'

S. Kumarasinghe
University of Kelaniya

The most difficult problem for us has been the location of a problem. At the inception of our honours course, the department thought students should carry out a short term project preferably linked to industry. Almost all chemically based industries in the country were written to, inquiring about the problems that might be investigated in our laboratories. The response was heart breaking! Only three institutions replied out of which only the BCC suggested a problem. That too turned out to be one in microbiology. It appeared to us that industry had very little confidence in the university.

Reasons to this lack of confidence or the lack of interest can be two fold. On the one hand, the indigenous category, such as the tea, rubber, coconut and paddy have their own research staff and laboratories which are better geared than the universities to handle their problems. On the other hand the category such as paint, polymer, soap manufacturer or even the rubber based industries work in collaboration with firms in the developed countries who supply the know how. For the local counterpart manufacture may be mainly mixing components in a given ratio under specified conditions. What ever the problem that arises is referred to their principals for a solution.

However, we have had some interactions with industry rather informally. When steel corporation had difficulties with the dull ferric stains produced with a substitute for an imported expensive base, our suggestions helped them to restore the brightness. In another instance application of the term buffer capacity helped a research institute to save a large volume of coconut milk. We were also able to solve a pollution problem at the nylon - 6 plant which arose due to a resinous by product containing a high proportion of caprolactan. When the Tyre - Corporation had a problem with their dusting agent turning blue when it should have been white, we were able to analyse and solve the problem as due to a high iron content.

Currently the department is engaged in a few long term projects. One is aimed at controlling a pest which affects the teak plantation with the application of pheromones. In another, upgrading of zircon is being attempted using the technique of microbial leaching. Upgrading of apatite from Eppawela has been attempted using hydrochloric acid. This project has yielded encouraging results. All these are being carried out with the knowledge of the relevant corporation or department.

Some time ago a technique for eradication of Salvinia was perfected in the department. The technique was developed starting from fundamentals by spraying a green coloured layer to hinder the process of photosynthesis which causes the rapid growth of the weed. Systematic elimination

of the components of this mixture lead to the identification of the active substance. This work has been published and still awaits recognition by the authorities and use in the affected areas.

'Water treatment in the textile Industry'

Lal de Mel
C.I.C. Ltd.

'Reduction of Chlorate contaminant in the chloralkali industry in Sri Lanka'

J.N.O. Fernando
University of Colombo

Caustic soda is produced in Sri Lanka in De-Nova type diaphrogm cells at Paranthan Chemicals Corporation. The effluent of the cell contains 1.3 g to 1.5 g of sodium chlorate per 100 g of sodium hydroxide and all the cells suffer from this defect. The chlorate that is present in the caustic soda contaminates the glycerine that is produced when coconut oil is hydrolysed with caustic soda. The export value of glycerine, which is one of our non-traditional export products, is thereby reduced.

The objective of the research project (jointly funded by the National Science Council of Sri Lanka and the Paranthan Chemicals Corporation from 1973 to 1976) was to identify the optimum conditions under which the electrolysis of brine would lead to the maximum production of sodium hydroxide with a minimum proportion of chlorate.

Pilot cells were constructed in our laboratories at the University of Colombo with a single carbon anode and double steel cathode, similar to those used at Paranthan. By using a lowered catholyte level, and a consequentially increased flow rate, were able to decrease the back diffusion of hydroxide ions and consequently discrease the amount of chlorate formed in the anolyte liquor. Experiments were also performed with simultaneous replenishment of anolyte liquor and pre-heating of feed brine. These studies also enabled us to obtain an even greater reduction of the anolyte chlorate and consequently catholyte chlorate reduction as well.

The studies were then repeated at Paranthan, in situ, at current loads of 3000A. These experiments yielded an even more significant chlorate reduction when simultaneous replenishment of anolyte liquor and pre-heating of feed brine was carried out. Experiments were also carried out with increasing replenishing rates of - anolyte liquor at a constant feed brine temperature of 55°C. We were thus able with a replenishment rate of approx. 661h-1 to reduce the chlorate concentration to 0.1 to 0.08 g per 100 g sodium hydroxide, anolyte liquor could also be re-circulated to cells via the saturations, thus eliminating the wastage of brine.

DISSEMINATION OF INFORMATION AND STRATEGIES FOR INTERACTION

26 May 1984, 2.00 - 4.30 p.m.

'Strategies for Interaction'

R.P. Gunawardena
University of Peradeniya

At present, University-Industry interactions are weak, except for some programmes involving university-undergraduate interactions. Research collaboration is recognised as the most important area of interaction. For this programme to be successful, it is necessary to identify research areas of common interest. It is also essential to maintain constant dialogue between the two institutions. The Universities can assist the industries in solving their chemical problems with the assistance from the students and the staff. Equipment available in the Universities should be made available to the industry and vice versa. Industry-academic staff interactions should be strengthened by formulating exchange programmes, consultancy services and also by inviting experts in industry to conduct relevant courses at the University.

'Role of the C.I.S.I.R. in University Industry Interaction in Chemistry'

C.L.M. Nethsinghe
C.I.S.I.R.

Problems are faced by University researchers and Industrialists in their search for scientific and technological information, which they require in their day to day work and/or when they start an industry/research project. CISIR Library has attempted to meet this need, by acquiring a wide range of indexing and abstracting services, which are used to monitor the world literature and to build up, with the assistance of foreign scientists, reprint files with special emphasis on chemical industries and utilisation of plant and mineral resources in Sri Lanka. Periodicals received in the Library are scanned and important items indexed. Ready access is thus possible by Sri Lankan researchers and industrialists to at least part of the published literature.

The paper will describe some of the literature that is available in the Library and discuss methods by which university - industry interaction can be strengthened through use of this literature.

'Transfer of Scientific and Technical Information'

N.U. Yapa
NARESA

A country's development depends on its ability to apply information generated by research in development processes. This could be done by establishing proper channels for information transfer. A system of scientific & technical information relating to development consists of 6 main components, viz. information sources, information centres, research workers, technologists and development planners. Transfer of information among various components of the system depends on the accessibility and needs of each component. Information transfer among research workers, development planners and technologists seems to be very weak in the case of our country. To improve the situation it is necessary to develop the resources and skills of information centres and extension workers and to create a forum representing each component.

'Dissemination of Information - Role of IDB'

G. Abeydeera
I.D.B.

Proper communication channels have to be established between generation and users of information. IDB operates an industrial information service to evaluate the needs of industrialists, who are the end-users of industrial information and provide them with appropriate information through Information Officers. It is observed that duplication of research work is taking place due to lack of co-ordination. Some valuable information generated by research is not transferred to appropriate users. This situation can be improved by employing effective communication methods and information specialists. Seminars, exhibitions and mass media could be used to improve awareness.

THE FACILITIES AND EXPERTISE OF UNIVERSITY CHEMISTRY DEPARTMENTS ARE GIVEN BELOW :-

UNIVERSITY OF COLOMBO

EQUIPMENT

1. Atomic absorption spectrophotometer - single beam with background corrector and graphite tube assembly for flameless atomic absorption measurements.
2. Gas-liquid chromatograph equipped with flame ionisation detector and thermal conductivity detector.
3. U.V. Visible spectrophotometer - double beam with scanning facilities.
4. Spectrophotometers covering visible range only.
5. Spectrofluorimeter with scanning facilities for emission and excitation spectra.
6. Polarographic analyzer with x-y recorder.
7. High-performance liquid chromatograph - with variable U.V. detector, conductivity detector, differential refractometer and standard columns for separation of polar, non-polar and ionic compounds.
8. Fraction collector with programmer, gradient pump, absorbance monitor and recorder.

Other teaching items of equipment are also available.

Staff	Field of Interest
Prof. R.S. Ramakrishna	Biogeochemistry, Trace metal and anions in Agriculture, Food and Drugs. Co-ordination chemistry of heavy metal ions.
Prof. W.P.D. Pereira	Photochemistry and reaction kinetics Biocides
Prof. M. Mahendran	Marine Natural Products chemistry Medicinal Plants.

Staff	Field of Interest
Dr. J.N.O. Fernando	Surface Chemistry study of Zeolites.
Dr. S. Hewage	Polarography Reaction kinetics in Inorganic Chemistry
Dr. L.M.V. Tillekeratne	Medicinal Plants Marine Natural Products Chemistry
Dr. S. Hettiarachchi	Corrosion, Electrochemistry
Dr. H.D. Gunawardene	Analytical Chemistry Reagent design, environmental monitoring Hydrometallurgy
Dr. A.P. de Silva	Photochemistry
Dr. E.D. de Silva	Marine Natural Products Chemistry
Dr. S. Deraniyagala	Bio-organic Chemistry

UNIVERSITY OF KELANIYA

EQUIPMENT

Pye Unicam	-	sp3-200 IR
Perkin Elmer	-	124 UV
Hittachi	-	163 GC (Dept. of Botany)

Staff	Field of Interest
Prof. J.K.P. Ariyaratne	Mineral sands Caustic soda selected Industries Organometallics Apatite , Weedicides
Dr. S. Kumarasinghe	Electroanalytical Chemistry
Mrs. S. Wimalasena	Natural Products, Analysis of plants of medicinal value
Dr. L.K.G. Wickremesinghe	Carbohydrates, Pheromones, Herbicides, Phytochemistry, Environmental Chemistry
Dr. Mrs. C.M. Arewgoda	Mineral sands, Electrochemical synthesis
Dr. Mrs. N. Gunawardene	Insect problems, Synthetic Organic Chemistry

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UNIVERSITY OF PERADENIYA

EQUIPMENT

1. X-ray diffraction equipment

   'Crystex' X-ray generator unit (model DF4) with Debye-Sherrer, Weissenberg and stationery film cameras with goniometers. The unit cell dimensions and the space group of single crystals could be determined. Powder photographs of the samples also can be taken using Debye-Sherrer camera.

2. Polarising microscope
3. Muffle furnace (max. temp. 1300°)
4. EEL flame photometers
5. Unicam SP 600 colorimeter
6. M.S.E. GF - 6 centrifuge
7. T. 60 Varian NMR
8. Perkin Elmer 257 IR spectrophotometer
9. Perkin Elmer 141 polarimeter
10. Unicam SP 8000 UV spectrophotometer
11. Waters High Performance Liquid Chromatograph (HPLC)
12. Varian-1400 Gas liquid chromatograph (GLC)
13. Uni Trap model 10-100 Freeze drier

Staff	Area of Specialization
Prof. G.P. Wannigama	Natural Products Chemistry
Prof. M. Selvaratnam	Electrochemistry
Prof. H.W. Dias	X-ray crystallography
Prof. S.G. Canagaratna	Electrochemistry
Prof. S. Sotheeswaran	Organosulphur Chemistry
Prof. V. Kumar	Natural Products Chemistry
Prof. N.S. Kumar	Natural Products Chemistry
Prof. A.A.L. Gunatilaka	Natural Products Chemistry
Prof. R.P. Gunawardane	Solid state Chemistry, phosphate fertilizers
Dr. W.M. Mallawarachchi	Theoretical Chemistry
Dr. O.A. Ileperuma	Co-ordination Chemistry
Dr. H.M.N. Bandara	Polymer Chemistry
Dr. J.S.H.Q. Perera	Electron spectroscopy and polymer Chemistry
Dr. B.M. Ratnayake Bandara	Synthesis and Natural Products Chemistry

UNIVERSITY OF SRI JAYEWARDENEPURA

EQUIPMENT

1. UV-VIS - Spectrophotometer
2. IR
3. GLC
4. HPLC
5. Freeze Drier
6. Plant Drier
7. Plus other standard laboratory equipment

These instruments are not available to provide a routine service to industry. However, they are available for use in connection with research projects.

Consultancy Services Available :

1. Development and standardisation of Pharmaceuticals.
2. Food products development, food preservation.
3. Waste Utilization.

Staff	Field of Interest
Prof. Tuley de Silva	Natural Products Chemistry, Food Chemistry & Pharmaceutical Chemistry
Dr. A.M. Abeysekera	Natural Products Chemistry, Physical Organic Chemistry
Dr. A. Bamunuarachchi	Food Chemistry and product development and Biochemistry, Biotechnology.
Dr. J. Wimalasena	Gas kinetics
Dr. Mrs. S. Samarasinghe	Natural Productus Chemistry Food Chemistry, Biotechnology
Mr. W.D.W. Jayatilleke	Polymer Science
Dr. W.S. Fernando	Spectroscopy
Dr. Mrs. Amaratunge	Organometallic Chemistry Phase transfer Catalysis
Dr. Mrs. Mahatantila	Organometallic Chemistry

NATIONAL COMMITTEE FOR UNIVERSITY-INDUSTRY INTERACTIONS IN CHEMISTRY (NC-UIIC)

Dr. F.S.C.P. Kalpage (Chairman)	Secretary, Ministry of Higher Education and Chairman, University Grants Commission
Prof. R.S. Ramakrishna	Professor and Head, Department of Chemistry, University of Colombo
Mr. C.S. de Saram	
Mr. S.C. Manicavasagar	Additional Secretary, Ministry of Industries and Scientific Affairs
Mr. S.J. Sumanasekera Banda	Deputy Secretary-General, Sri Lanka National Commission for UNESCO
Mr. K.T. Wimalaratne (Secretary)	Senior Assistant Secretary, Ministry of Higher Education

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INDUSTRIAL LIAISON OFFICERS:

Dr. J.N.O. Fernando	University of Colombo
Dr. R. Mageswaran	University of Jaffna
Prof. R.P. Gunawardena	University of Peradeniya
Prof. R.H. Wijayanayake	University of Ruhuna
Prof. K.T. de Silva	University of Sri Jayewardenepura
Dr. K.W.S. Kularatne	Open University of Sri Lanka
