IPT
Instituto de Pesquisas Tecnológicas

CURRICULUM VITAE

PERSONAL DATA

NAME: Eduardo Albertin
BIRTH DATE: December 21st, 1952
POSITION: Head, Foundry and Mechanical Working Group
INTEREST AREAS: Metal Casting

ACADEMIC BACKGROUND

·LEVEL	·TITLE	·UNIVERSITY	·YEAR
UNDERGRADUATION:	Engineer	"Mauá" Engineering School	1975
MASTER DEGREE:	Master of science	University of S. Paulo	1984
DOCTOR:			
SPECIALIZATION:			

PROFESSIONAL ACTIVITIES

·ACTIVITY	·ORGANIZATION	·LEVEL	·PERIOD

.Research on the metallurgy of casting alloys
.Technology transfer from IPT to Industry
.Courses on Foundry Technology.

TECHNICAL WORKS

.ALBERTIN, E.; SINATORA,A. Análise da fratura e do desgaste irregular de bolas de moinho de ferros fundidos brancos de alto cromo. In: SEMINÁRIO BRASILEIRO SOBRE MATERIAIS RESISTENTES AO DESGASTE, 2., Uberlândia, 1991 (dezembro). (Analysis of the fracture and of the non-uniform wear of high chromium cast iron balls).
.FUOCO, R. et al. Production of compacted/vermicular graphite cast iron using Mg/Al treatment. In: INTERNATIONAL FOUNDRY CONGRESS, 56. Düsseldorf, 1989. Proceedings...Düsseldorf: Verein Deutsches Giessereifachleute, 1989. paper 20.
.ALBERTIN, E. et al. Effects of carbon, chromium and molybdenum contents on solidification and microstructure of 15 or 20% Cr white cast irons. In: INTERNATIONAL FOUNDRY CONGRESS, 55., Moscow, 1988. Papers... Moscow: CIAFT, 1988. p.4.1-4.17.
.ALBERTIN, E. et al. Factors affecting ductile-brittle transition of ferritic spheroidal graphite cast irons. In: METALLURGY INTERNATIONAL CONGRESS, 1988, Bologna.

NUMBER OF PUBLICATIONS: 30

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Instituto de Pesquisas Tecnológicas

CURRICULUM VITAE

PERSONAL DATA

NAME: Eduardo Camargo O. Pinto
BIRTH DATE: 19.07.38
POSITION: Head of Metals and Alloys Preparation Group
INTEREST AREAS: metallurgical processes

ACADEMIC BACKGROUND

·LEVEL	·TITLE	·UNIVERSITY	·YEAR
UNDERGRADUATION:	Engineer	Univ. of São Paulo	1961
MASTER DEGREE:	Master of Science	Univ. of São Paulo	1971
DOCTOR:			
SPECIALIZATION:	Institut de Rechêrche de la Sidérurgie Française-IRSID.		1967

PROFESSIONAL ACTIVITIES

·ACTIVITY	·ORGANIZATION	·LEVEL	·PERIOD
. Melting and refining of metal and alloys research projects (1862-1992).			
. Investment casting of steels research projects (1962-1970)			
. Technology transfer to industry (metal refining)			
. Steel production teaching (EPUSP - Mauá)			

TECHNICAL WORKS

. Vacuum decaburization of steels. Metalurgia ABM, 35 (258): 317-322, May 1979

. Nickel deoxidation and desulphurization. Metalurgia ABM, 40 (318): 269-273, May 1984

. Project and building of supersonic nozzle for oxygen injection lance. Metalurgia ABM, 22 (108): 895-902, april 1966.

NUMBER OF PUBLICATIONS: 32

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Instituto de Pesquisas Tecnológicas

CURRICULUM VITAE

PERSONAL DATA

NAME: Flavio Beneduce Neto

BIRTH DATE: 03.04.58

POSITION: Researcher (Head of Metallurgical Processes Lab.)

INTEREST AREAS: Metallurgical Processes

ACADEMIC BACKGROUND

·LEVEL	·TITLE	·UNIVERSITY	·YEAR
UNDERGRADUATION:	Engineer	Industrial Engineering College –	1982
MASTER DEGREE:	Master of Science	Univ. of São Paulo	1991
DOCTOR:			
SPECIALIZATION:			

PROFESSIONAL ACTIVITIES

·ACTIVITY	·ORGANIZATION	·LEVEL	·PERIOD

. Melting and refining of metals and alloys research projects

. Rare earth calciothermic reduction

. Metallurgical physical-chemistry teaching (FEI)

TECHNICAL WORKS

. Low carbon steel desulphurization on vacuum induction furnace by adding mischmetal. Procedings of 42nd annual congress of Brazilian Metals Association, 1987.

. Alloy design to control the size and morphology of niobium carbides in tools steels. Procedings of 1st International Conference on tool steels, 1990.

. Contribution to the study of metal/refractory interactions in a vacuum induction furnace. Procedings of 46th annual congress of Brazilian Metals Association, 1991.

. Reducing dephosphorization of manganese steel. Procedings of 46th annual congress of Brazilian Metals Association, 1991.

NUMBER OF PUBLICATIONS: 11

IPT
Instituto de Pesquisas Tecnológicas

CURRICULUM VITAE

PERSONAL DATA

NAME: George Bezerra
POSITION: Researcher
BIRTH DATE: 04.10.56
INTEREST AREAS: X-ray diffraction and scanning electron microscopy

ACADEMIC BACKGROUND

·LEVEL	·TITLE	·UNIVERSITY	·YEAR
UNDERGRADUATION:	Engineer	Univ. of São Paulo	1981
MASTER DEGREE:	Master of Science	Univ. of São Paulo	1984
DOCTOR:	Ph.D.	Univ. of São Paulo	1988

SPECIALIZATION: X-ray diffraction on Laboratoire pour L'Utilization du Rayonnement Electromagnetique - ORSAY - France

PROFESSIONAL ACTIVITIES

·ACTIVITY	·ORGANIZATION	·LEVEL	·PERIOD

. Professor of X-ray diffraction and scanning electron microscope
. Researcher of Metalography Lab. - IPT

TECHNICAL WORKS

. A method for determination of partial structure factors of binary amorphous alloys - J. Non - Cryst. Sol., 126, 239 (1990)

NUMBER OF PUBLICATIONS: 03

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Instituto de Pesquisas Tecnológicas

CURRICULUM VITAE

PERSONAL DATA

NAME: Hamilton Lelis Ito

BIRTH DATE: 04.08.50

POSITION: Head of Characterization of Metallurgical Products Group

INTEREST AREAS: Materials Characterization and Failure Analysis.

ACADEMIC BACKGROUND

·LEVEL	·TITLE	·UNIVERSITY	·YEAR
UNDERGRADUATION:	Metal. Engineer	Univ. of São Paulo	1974
MASTER DEGREE:	Master of Science	Univ. of São Paulo	1982
DOCTOR:	Ph.D.	Univ. of São Paulo	1991

SPECIALIZATION: on non destructive testing - USA 1978

PROFESSIONAL ACTIVITIES

·ACTIVITY	·ORGANIZATION	·LEVEL	·PERIOD

. Metallurgical engineer

. Professor at Department of Metallurgy of Industrial Engineering Faculty

. Invited Lecturer at Engineering Institute São Paulo

TECHNICAL WORKS

. Failures of Gears - III Brazilian Seminar of Gears - 1990

and more than 200 confidential Reports on Failure Analysis.

NUMBER OF PUBLICATIONS: 5

IPT
Instituto de Pesquisas Tecnológicas

CURRICULUM VITAE

PERSONAL DATA

NAME: Mário Boccalini Jr.
BIRTH DATE: July 16th, 1959
POSITION: Researcher
INTEREST AREAS: Foundry Laboratory-Metallurgy Division

ACADEMIC BACKGROUND

·LEVEL	·TITLE	·UNIVERSITY	·YEAR
UNDERGRADUATION:	Engineer	University of S. Paulo	1981
MASTER DEGREE:	Master of science	University of S. Paulo	1990
DOCTOR:			
SPECIALIZATION:			

PROFESSIONAL ACTIVITIES

·ACTIVITY	·ORGANIZATION	·LEVEL	·PERIOD
.Research on the Metallurgy of Casting Alloys			
.Research on the Investment casting Process			

TECHNICAL WORKS

."Macro and Microstructure Aspects of as Cast Cu-Zu Alloys". M.Sc. Thesis. 1990
."Effects of strontium modification and solution heat treatment on the silicon morphology in A356 aluminum alloy investment castings".57th World Foundry Congress. 1990
."HOT TEARS IN INVESTMENT CAST Nb-ALLOYED STAINLESS STEELS". V National Foundry Congress (Brazil). 1991

NUMBER OF PUBLICATIONS: 12

IPT

Instituto de Pesquisas Tecnológicas

CURRICULUM VITAE

PERSONAL DATA

NAME: Ricardo Fuoco

BIRTH DATE: June 21st, 1957

POSITION: Foundry Laboratory Manager

INTEREST AREAS: Foundry Fields
Metallurgy Division

ACADEMIC BACKGROUND

·LEVEL	·TITLE	·UNIVERSITY	·YEAR
UNDERGRADUATION:	Engineer	University of S. Paulo	1981
MASTER DEGREE:	Master of Science	University of S. Paulo	1989
DOCTOR:			

SPECIALIZATION: McGill University - 1992

PROFESSIONAL ACTIVITIES

·ACTIVITY	·ORGANIZATION	·LEVEL	·PERIOD
.Technology transfer to Industry			
.Research on cast iron and aluminium alloys metallurgy and casting			

TECHNICAL WORKS

.Comparison between Sr-Modified and Sb-refined A356 Aluminum Castings - National Foundry Congress - S. Paulo - 1991

.Effects of Strontium modification and solution heat treatment on the silicon particles morphology in A356 Aluminum alloy investment castings. 57th World Foundry Congress, Osaka, Japan, 1990

.Production of compacted/vermicular graphite cast iron using Mg/Al treatment 56th World Foundry Congress, Düsseldorf, Germany, 1989.

NUMBER OF PUBLICATIONS: 30

IPT
Instituto de Pesquisas Tecnológicas

C U R R I C U L U M V I T A E

PERSONAL DATA

NAME: Tomoe Oide Tsubaki
BIRTH DATE: 12.06.50
POSITION: Head of Analitical Support Lab.
INTEREST AREAS: Inorganic Analitical Chemistry

ACADEMIC BACKGROUND

·LEVEL	·TITLE	·UNIVERSITY	·YEAR
UNDERGRADUATION:	Chemistry	Univ. of São Paulo	1975
MASTER DEGREE:			
DOCTOR:			

SPECIALIZATION: CQE (Control Quality Engineer)

PROFESSIONAL ACTIVITIES

·ACTIVITY	·ORGANIZATION	·LEVEL	·PERIOD
. Analitical methods development			

TECHNICAL WORKS

NUMBER OF PUBLICATIONS: 01

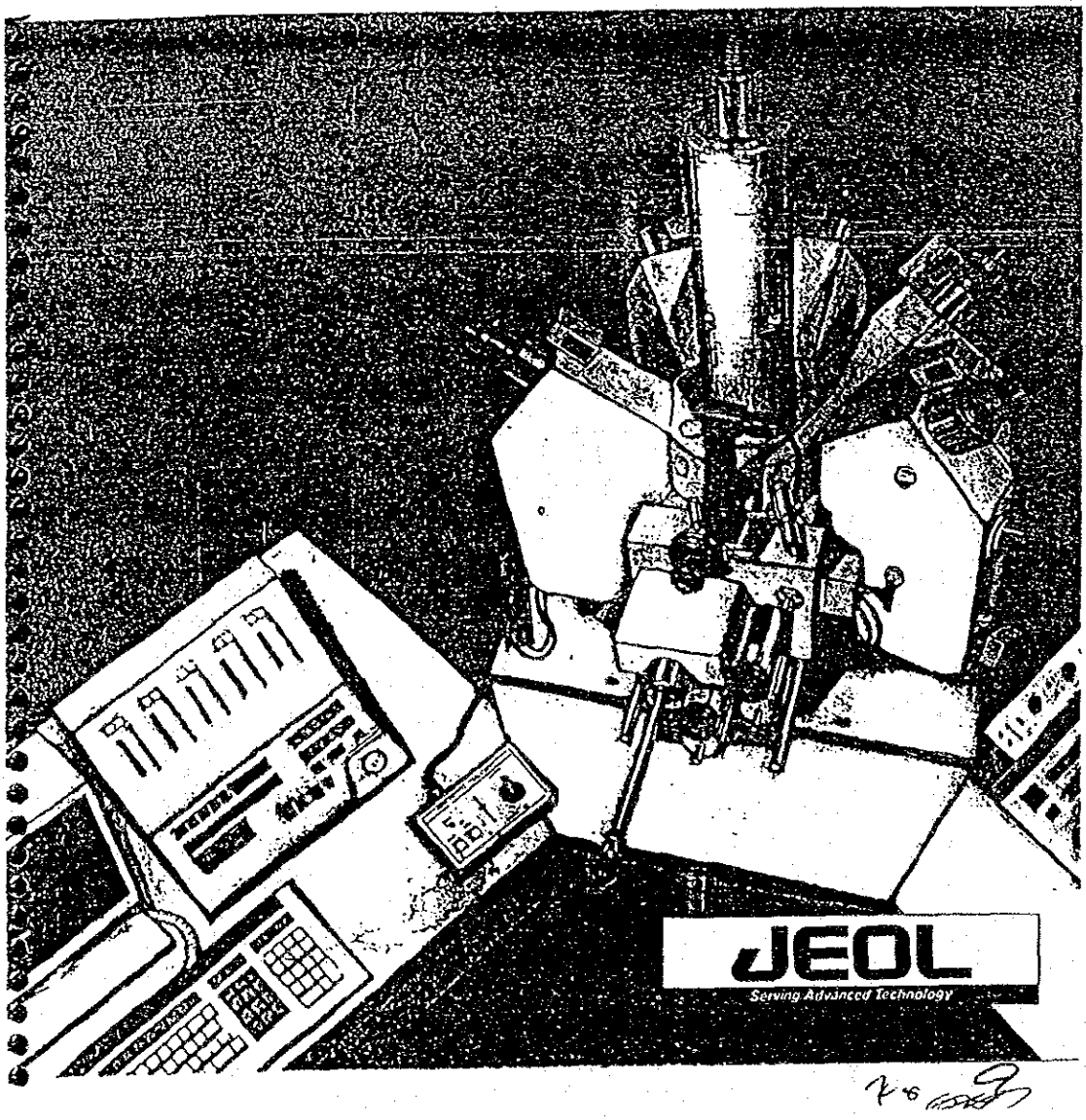
EQUIPMENTS

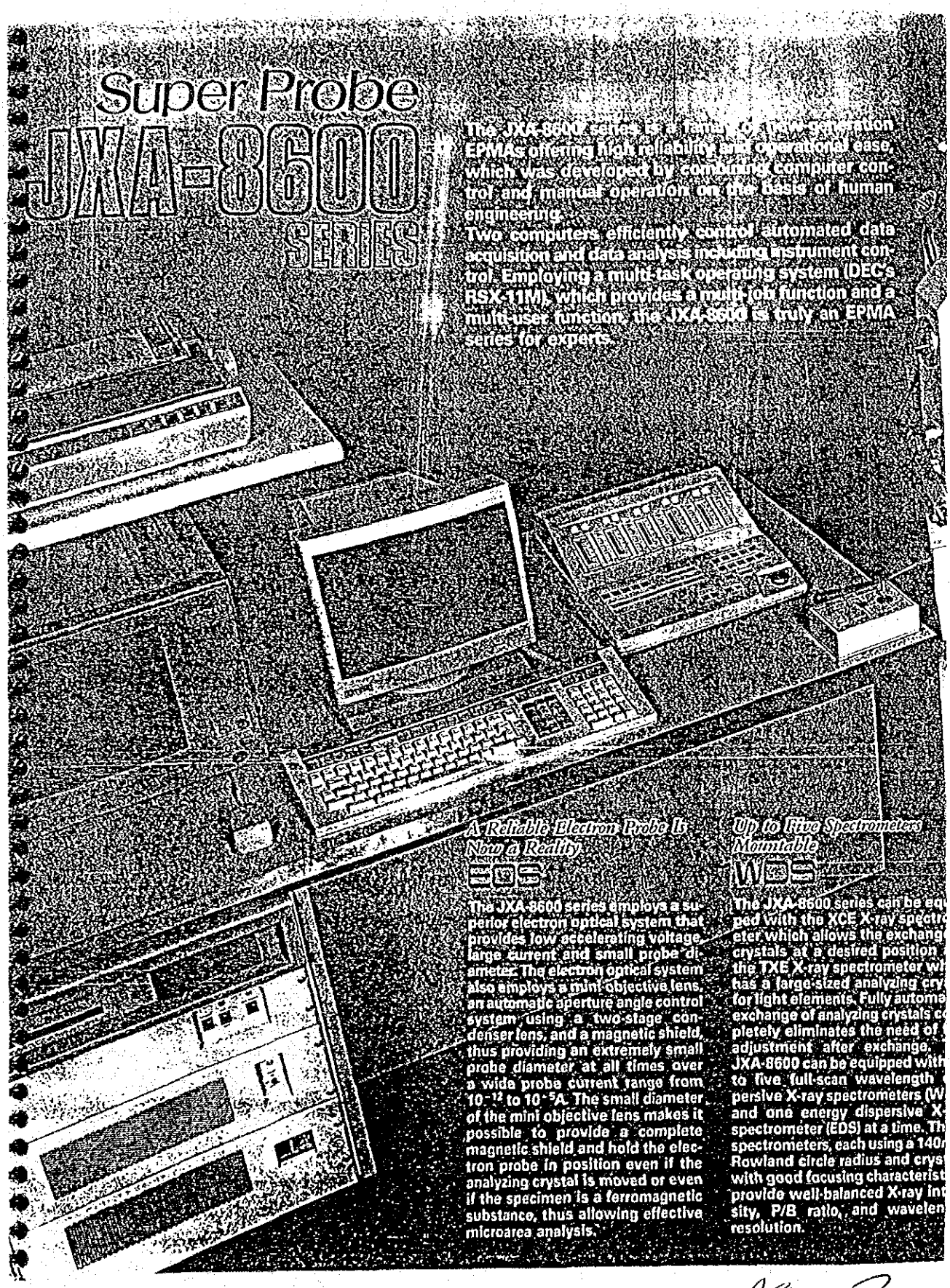
SPECIFICATION

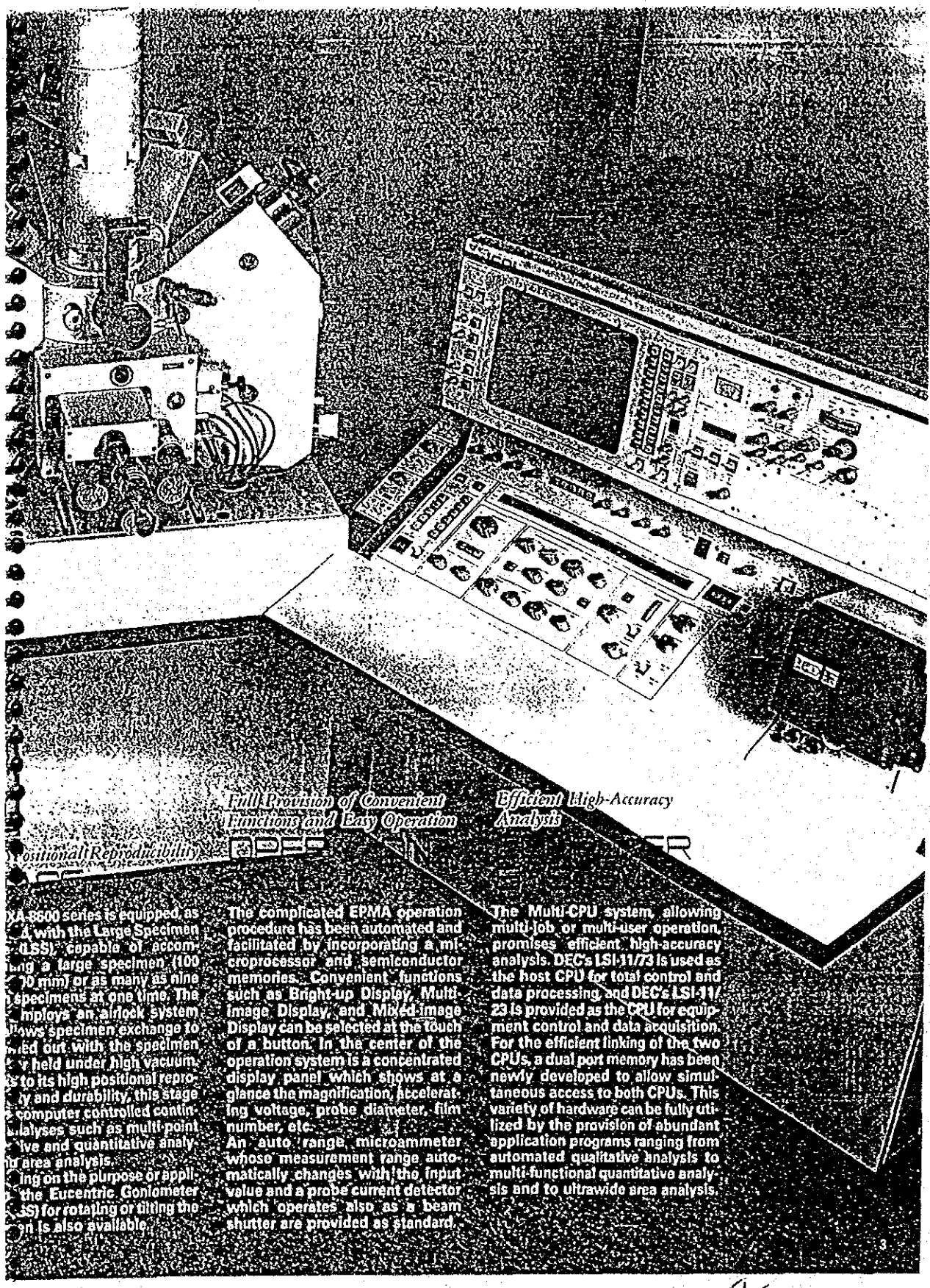
Super Probe JXA-8600 Series

Electron Probe X-ray Microanalyzers

1




Super Probe
JXA-8600
SERIES
The JXA-8600 series is a family of three automation EPMAs offering high reliability and operational ease, which was developed by combining computer control and manual operation on the basis of human engineering.
Two computers efficiently control automated data acquisition and data analysis including instrument control. Employing a multi-task operating system (DEC's RSX-11M), which provides a multi-job function and a multi-user function, the JXA-8600 is truly an EPMA series for experts.
A Reliable Electron Probe Is Now a Reality...
EOS
The JXA-8600 series employs a superior electron optical system that provides low accelerating voltage, large current and small probe diameter. The electron optical system also employs a mini objective lens, an automatic aperture angle control system using a two-stage condenser lens, and a magnetic shield, thus providing an extremely small probe diameter at all times over a wide probe current range from 10^{-12} to 10^{-5}A. The small diameter of the mini objective lens makes it possible to provide a complete magnetic shield and hold the electron probe in position even if the analyzing crystal is moved or even if the specimen is a ferromagnetic substance, thus allowing effective microarea analysis.
Up to Five Spectrometers Mountable
WDS
The JXA-8600 series can be equ
ged with the XCE X-ray spectro
eter which allows the exchang
crystals at a desired position
the TXE X-ray spectrometer wh
has a large-sized analyzing cry
for light elements. Fully automa
exchange of analyzing crystals c
pletely eliminates the need of
adjustment after exchange.
JXA-8600 can be equipped with
to five full-scan wavelength
persive X-ray spectrometers (W
and one energy dispersive X-
spectrometer (EDS) at a time. Th
spectrometers, each using a 140
Rowland circle radius and crys
with good focusing characteris
provide well-balanced X-ray int
sity, P/B ratio, and wavelen
resolution.



Positional Reproducibility

XA-8600 series is equipped as
with the Large Specimen
(LSS), capable of accom-
ing a large specimen (100
0 mm) or as many as nine
specimens at one time. The
mploys an airlock system
lows specimen exchange to
ed out with the specimen
held under high vacuum.
to its high positional repro-
y and durability, this stage
computer controlled contin-
alyses such as multi-point
ive and quantitative analy
area analysis.
ing on the purpose or appli-
the Eucentric Goniometer
S) for rotating or tilting the
n is also available.

Full Provision of Convenient Functions and Easy Operation

The complicated EPMA operation procedure has been automated and facilitated by incorporating a microprocessor and semiconductor memories. Convenient functions such as Bright-up Display, Multi-image Display, and Mixed-image Display can be selected at the touch of a button. In the center of the operation system is a concentrated display panel which shows at a glance the magnification, accelerating voltage, probe diameter, film number, etc.
An auto range microammeter whose measurement range automatically changes with the input value and a probe current detector which operates also as a beam shutter are provided as standard.

Efficient High-Accuracy Analysis

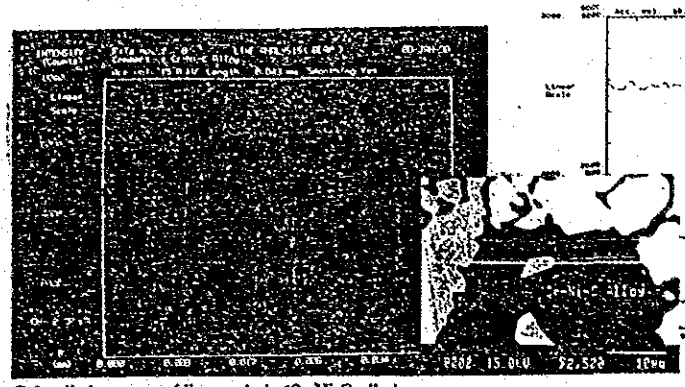
The Multi-CPU system, allowing multi-job or multi-user operation, promises efficient high-accuracy analysis. DEC's LSI-11/73 is used as the host CPU for total control and data processing, and DEC's LSI-11/23 is provided as the CPU for equipment control and data acquisition. For the efficient linking of the two CPUs, a dual port memory has been newly developed to allow simultaneous access to both CPUs. This variety of hardware can be fully utilized by the provision of abundant application programs ranging from automated qualitative analysis to multi-functional quantitative analysis and to ultrawide area analysis.

APPLICATIONS

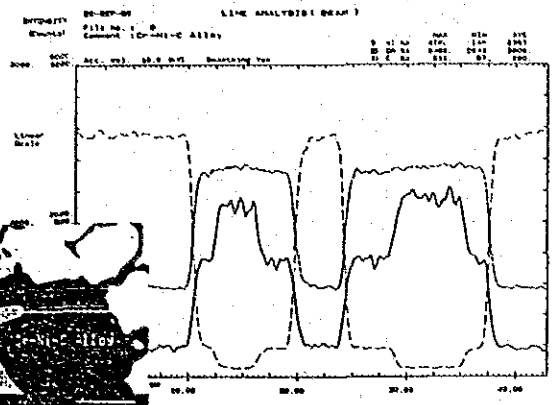
● Quantitative Analysis ● Line Analysis ● Manipulation ●

● Line Analysis Program

After line analysis is made by stage scan and beam scan,* the results are output to the printer, color display and graphic plotter.



Color display screen of line analysis (Cr-Ni-C alloy)



Graphic plotter output of line analysis (Cr-Ni-C alloy)

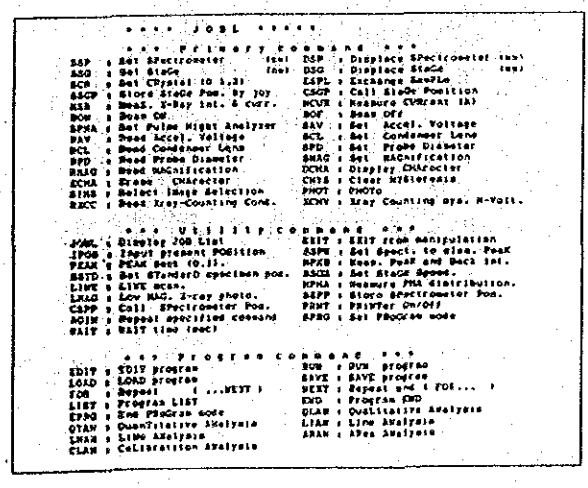
● Manipulation Program

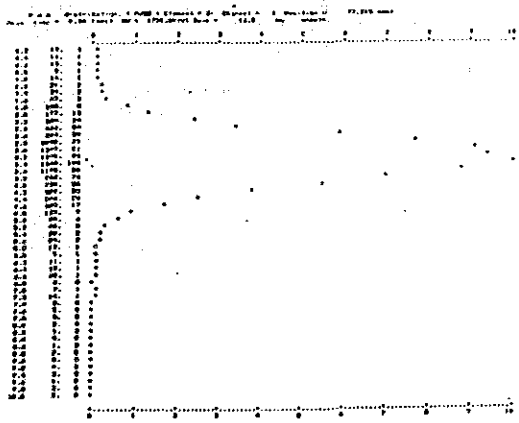
Main functions (commands)

- Display of characters on observation CRT (DCHA)
- Measurement of pulse height distribution curve (MPHA)
- Automated photographing of low-magnification X-ray images (LMAG)
- Spectrometer setting by element symbol input (SSPK)
- Peak search (PEAK)
- Measurement of peak intensity and background (MPKB)
- Selection of display image on observation CRT (SIMS)
- Line analysis using chart recorder (LINE)

The program can be created so as to allow the various commands to be executed sequentially.

Character display on observation CRT (examples of FeB, Fe2B)





*Pulse height distribution curve**

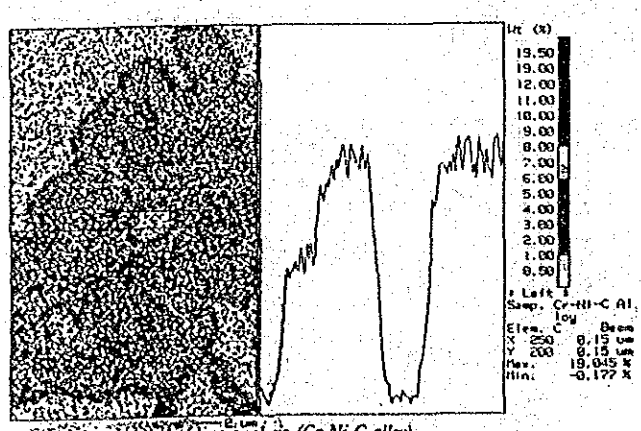
●Area Analysis Program

Area analysis of not only microacreas but also macroareas can be performed by acquiring the information on X rays, backscattered electron, secondary electrons, etc., as two-dimensional distribution data by use of the electron probe digital scanning method and specimen stage X-Y drive scanning method. The data is processed into an element map obtained by the calibration cure method, a combination map, a correlation map, element ratio map, etc. and are output to a color display or graphic plotter*. Compared with the conventional X-ray image display, the color mapping method allows you to freely select the color display level for better space resolution and X-ray image contrast, and also enables you to analyze a macroareas with a micron-order accuracy.

Concentration Map Program

(built into XM-86MAPS)

With this program, a portion of CKα concentration map is enlarged and the line profile of the average concentration in the area sandwitched by two parallel lines is displayed on a color map.



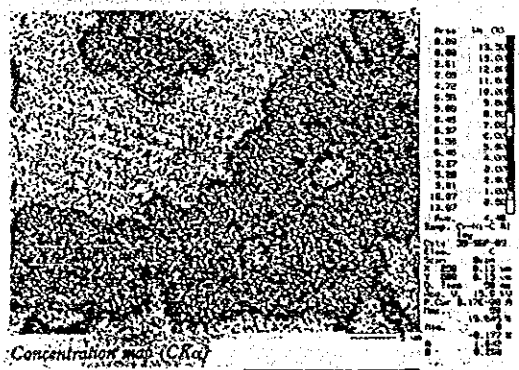
Graphic plotter output of line analysis (Cr-Ni-C alloy)

Combination Map Program* (XM-86CMMAP)

The combination map overlappingly displays the distributions of two or three elements on the same screen in color. When you specify your desired threshould concentration values of individual elements, areas of larger concentrations than the values are displayed in color. When two or more elements exist in the same area, they are displayed in a mixed color. This display method is effectively used for examining how plural elements coexist.

Compo image (Cr-Ni-C alloy)

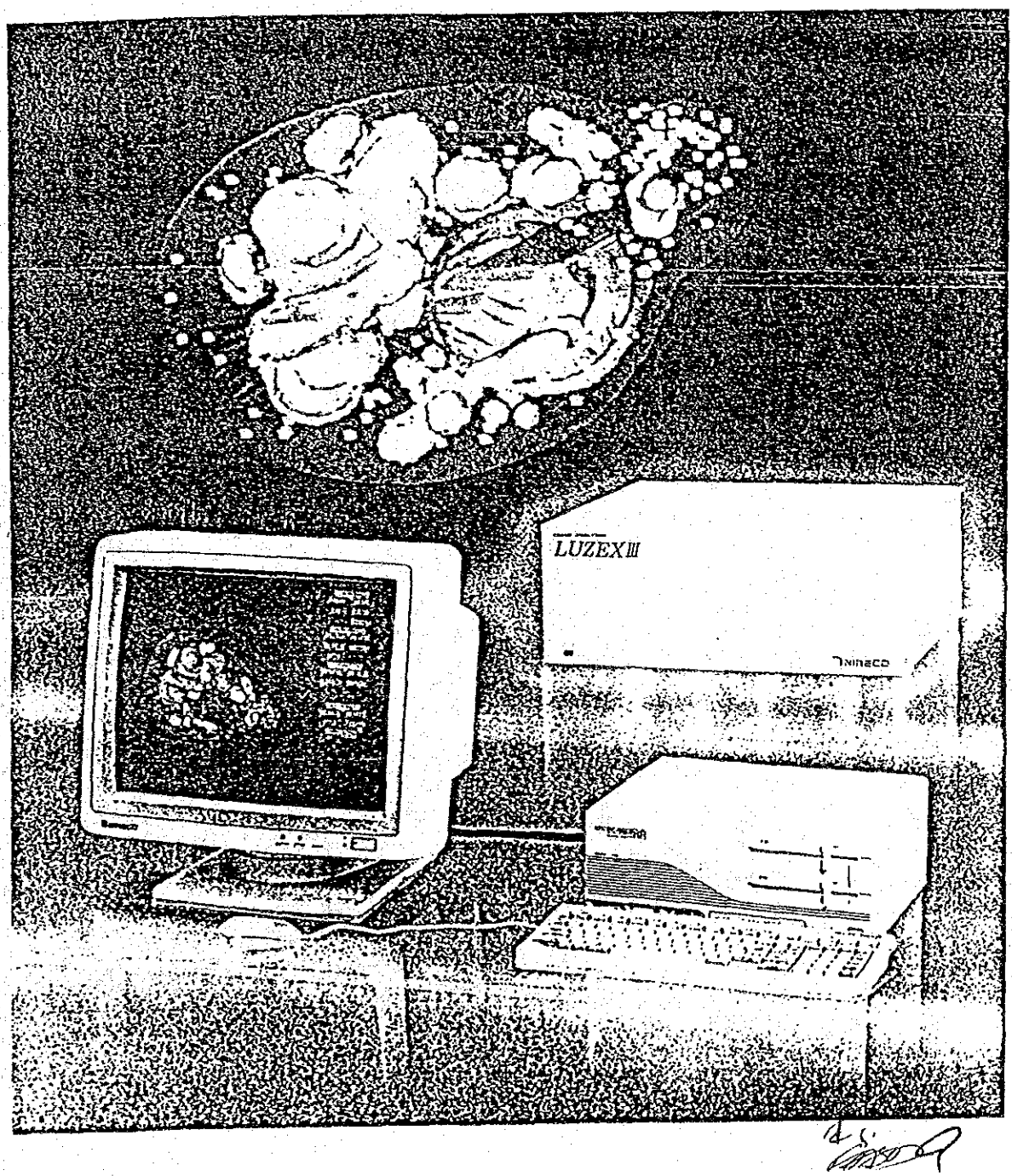
Intensity map (backscattered electron compo image)

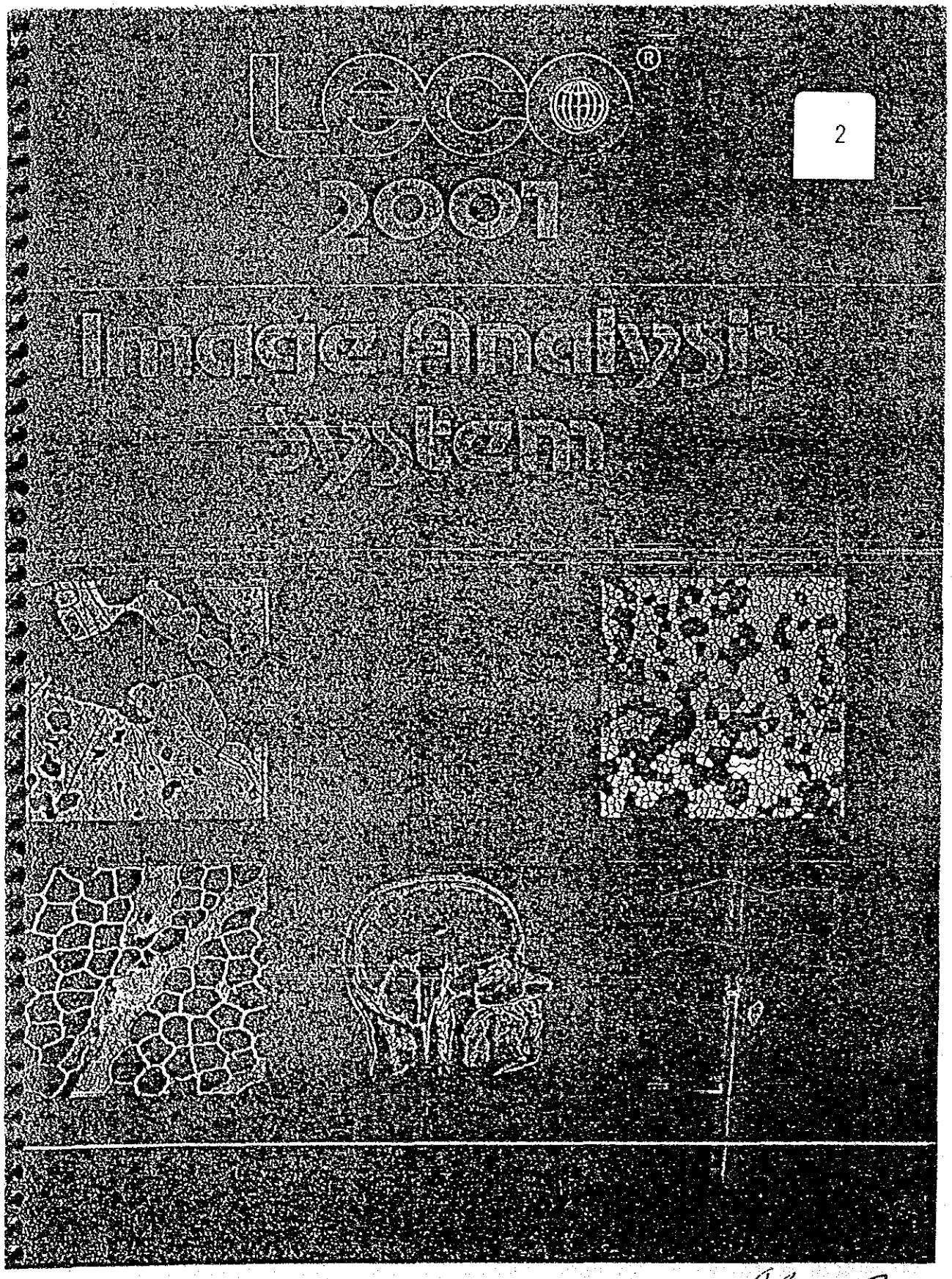


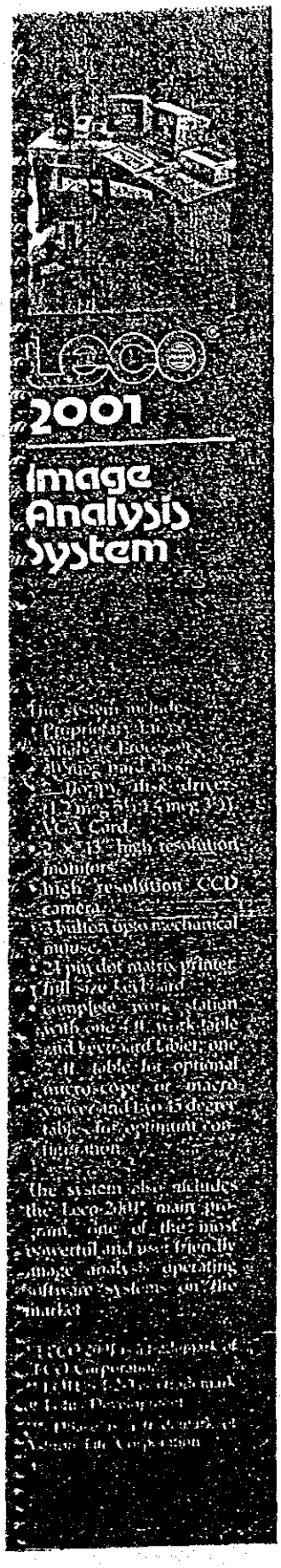
Concentration map (CKα)

Combination map (Cr-Ni-C)

ルーゼックスⅢ




2001
Image Analysis
System
2



LECO-2001...

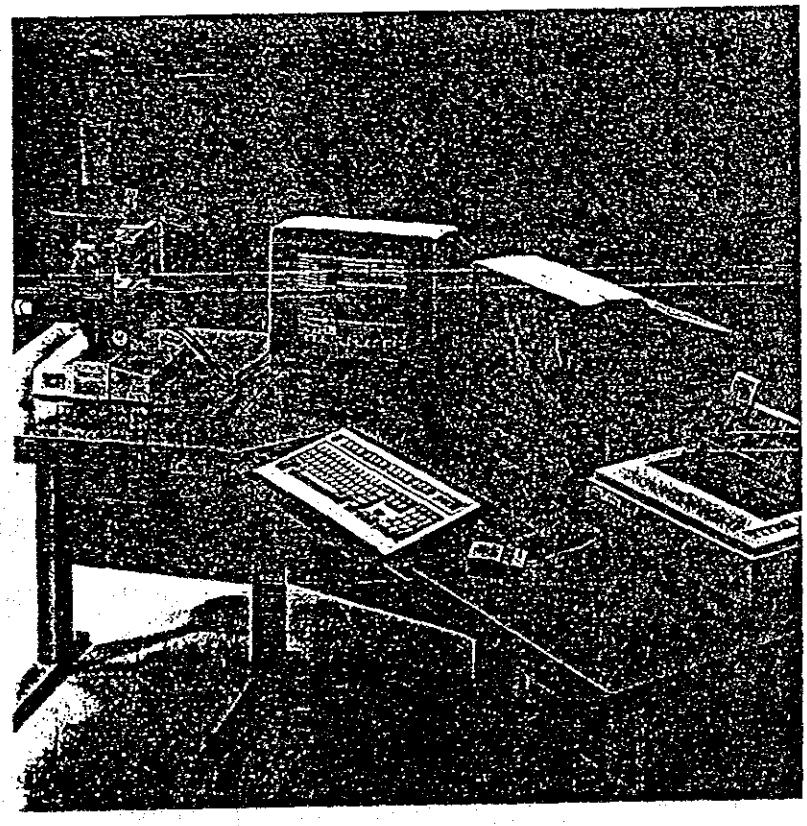
LECO CORPORATION a world leader in analytical laboratory instrumentation presents one of the most powerful image analysis systems available today...the LECO 2001.

This unique system combines power, speed and flexibility for unlimited applications in such fields as metallography, mineralogy, geology, biology, composite materials, ceramics, electronics and many more.

The LECO 2001 Image Analysis System is extremely simple to operate. The system has been designed for use by operators with or without image processing experience. These operators can learn how to execute simple or complex image analysis measurements in a wide variety of materials. The LECO 2001 allows technicians, engineers or scientists to carry out analytical work to meet their individual needs.

The LECO 2001 is mouse driven and provides the operator with the ability to build routines by selecting various instructions for his own application. Results, images and data can be stored on the 40 meg hard disk and/or be processed by the LECO I.P.U. or transmitted by the optional Hyper Modem to computers. All results and data can be converted to ASCII, LOTUS**, DBASE***, or most any other type of files.

The menus of the LECO 2001 are written totally in graphics mode. These menus combined with some of the best CCD camera and monitors available today, produce sharp and crisp images unexcelled in the industry.



The LECO 2001 is completely supported by LECO, worldwide.
The LECO 2001 Image Analysis System, the finest of its kind!

LECO-2001 HARDWARE

The LECO 2001 image analysis processor is divided in three basic sections:

[illegible]

DIGITIZING:

As many as four independent cameras or other electronic input devices including S.E.M., T.E.M., E.D.X. etc. can be permanently connected to the LECO 2001. The analog signal produced by one of these devices is converted into digital data, then stored in the image processor. The digitized image consists of an array of 512 x 480 picture elements (pixels) of 256 grey levels according to the intensity of each pixel. Color digitizing in RGB or NTSC format is also supported by the processor for future color applications.

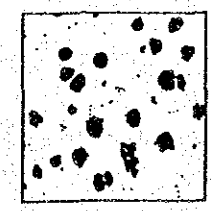
PROCESSING:

This is the heart of the LECO 2001 system where most of the image analysis algorithms are implemented in hardware. This configuration allows the LECO 2001 to execute instructions such as: autothreshold, thinning, convolutions, noise averaging, histograms, digital shading correction, logical operations and binary image morphology many times faster than other image analysis systems, running by software alone.

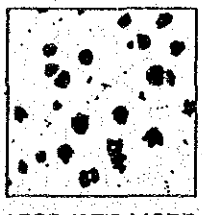
AUTOTHRESHOLD:

LECO engineers have written complex algorithms that totally eliminate the subjectivity of manually setting the grey level thresholds, common to every image analysis systems. Operator dependant threshold adjustments can lead to significant errors in measurements as shown in the following example:

ACTUAL MEASUREMENT VALUE: 13.22%



Under detected
phase area=11.58%



LECO AUTO-MODE
phase area=13.25%

Over detected
phase area=14.45%

The LECO 2001's powerful image processing unit can automatically identify up to 8 phases, independently of illumination level and operator's subjectivity for accurate and repetitive detection of multi-phase samples. See Figs. 1 & 2.

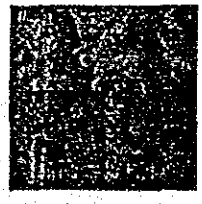


Fig.1 showing 6
phases by
AUTO-MODE

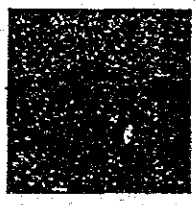


Fig.2 showing 7
phases by
AUTO-MODE

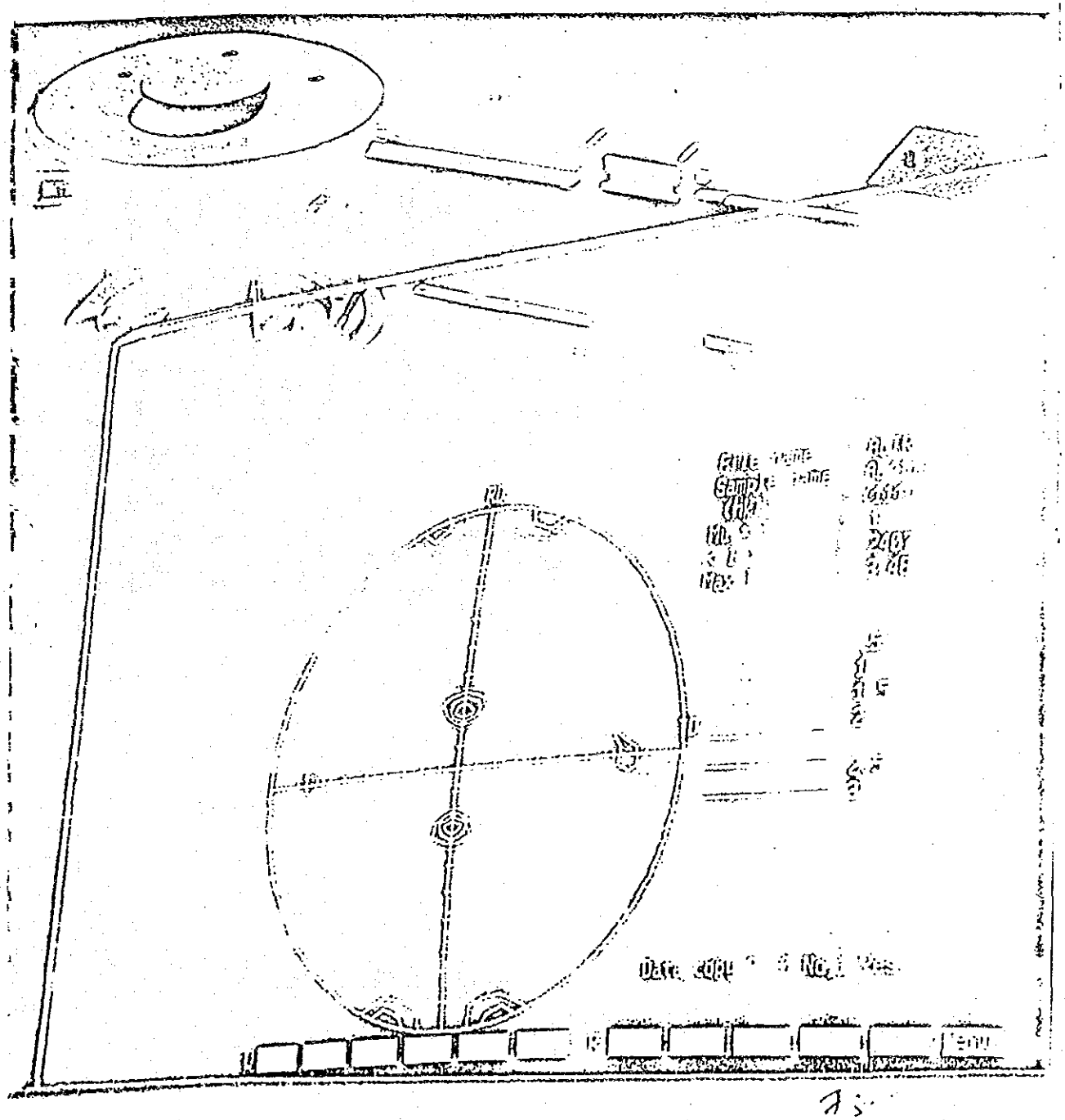
DISPLAY

The display function allows the operator to view the image in the digitized mode at standard magnification or, increased by 2X, 4X or 8X factors with the zoom feature to observe fine details. A drawing chip is present to quickly generate plots, graphs and histograms at the end of each analysis. Bit planes are represented as color overlays on the grey level image. Image and guard frames are then superimposed on both the grey level image and the bit plane image.

Rigaku

Rigaku/New X-ray Diffractometer System "Geigerflex" D/max-C Series

3



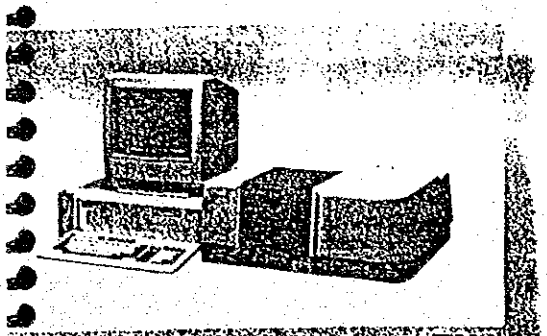
SHIMADZU

C00G-E001

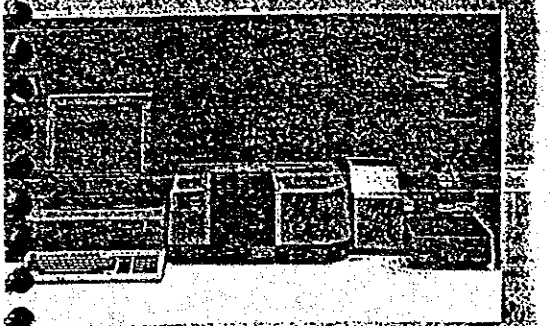
4

SHIMADZU SCIENTIFIC INSTRUMENTS AND EQUIPMENT

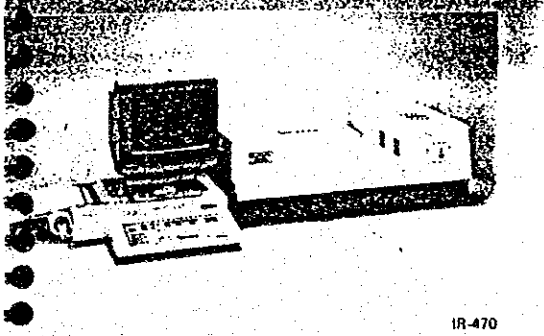
INFRARED SPECTROPHOTOMETERS



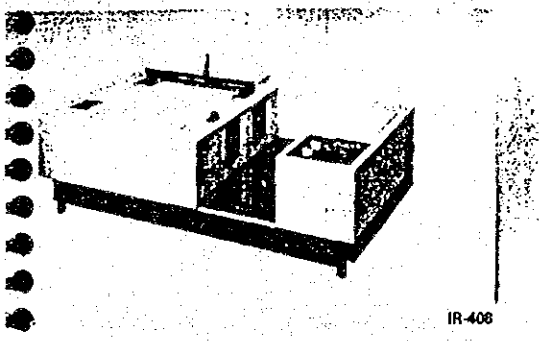
FTIR-8101



FTIR-8101M Microscopy System



IR-470



IR-408

FTIR-8101/8101M
Fourier Transform Infrared Spectrophotometer

Though available at the cost of a dispersive IR instrument the FTIR-8101 and FTIR-8101M are true FTIR instruments.

- High resolution of $2cm^{-1}$
- The completely sealed interferometer ensures high stability even in humid environment.
- The multiwindow system ensures exceptional ease of operation
- High level data processing capabilities are incorporated as standard, such as Kubelka-Munk conversion and Kramers-Kronig analysis.
- The automatic alignment system of the interferometer ensures high stability.
- The microprocessor system ensures multitasking operation.
- High signal-to-noise ratio provides high sensitivity and high speed in analysis.

FTIR-8101M
Microscopy System

The combination of the IMS-8000 infrared spectrophotometer provides highly reliable FTIR measurement of micro samples.

- The fast optical system and the highly sensitive MCT detector combine to provide ease of measuring dark or extremely small samples.
- The Shimadzu's original Cassegrain reflecting objective ensures high resolusion.
- The transmission mode and the reflectance mode are selected by one touch operation. The optics are optimized for the both modes, to ensure exceptionally high sensitivity.
- The system can be easily switched to ordinary FTIR operation, without removing the microscope unit.

IR-470
Infrared Spectrophotometer

Employing Shimadzu's original ratio photometry system based on independent double-frequency tuning, high sensitivity and accuracy can be assured in IR-470.

- Photometry system : Double-beam, independent double-frequency tuning ratio system
- Wavenumber range : 400~4000 cm^{-1}
- CRT : 12" color CRT, multipage system display
- Printer : Parallel line printer

IR-408
Infrared Spectrophotometer

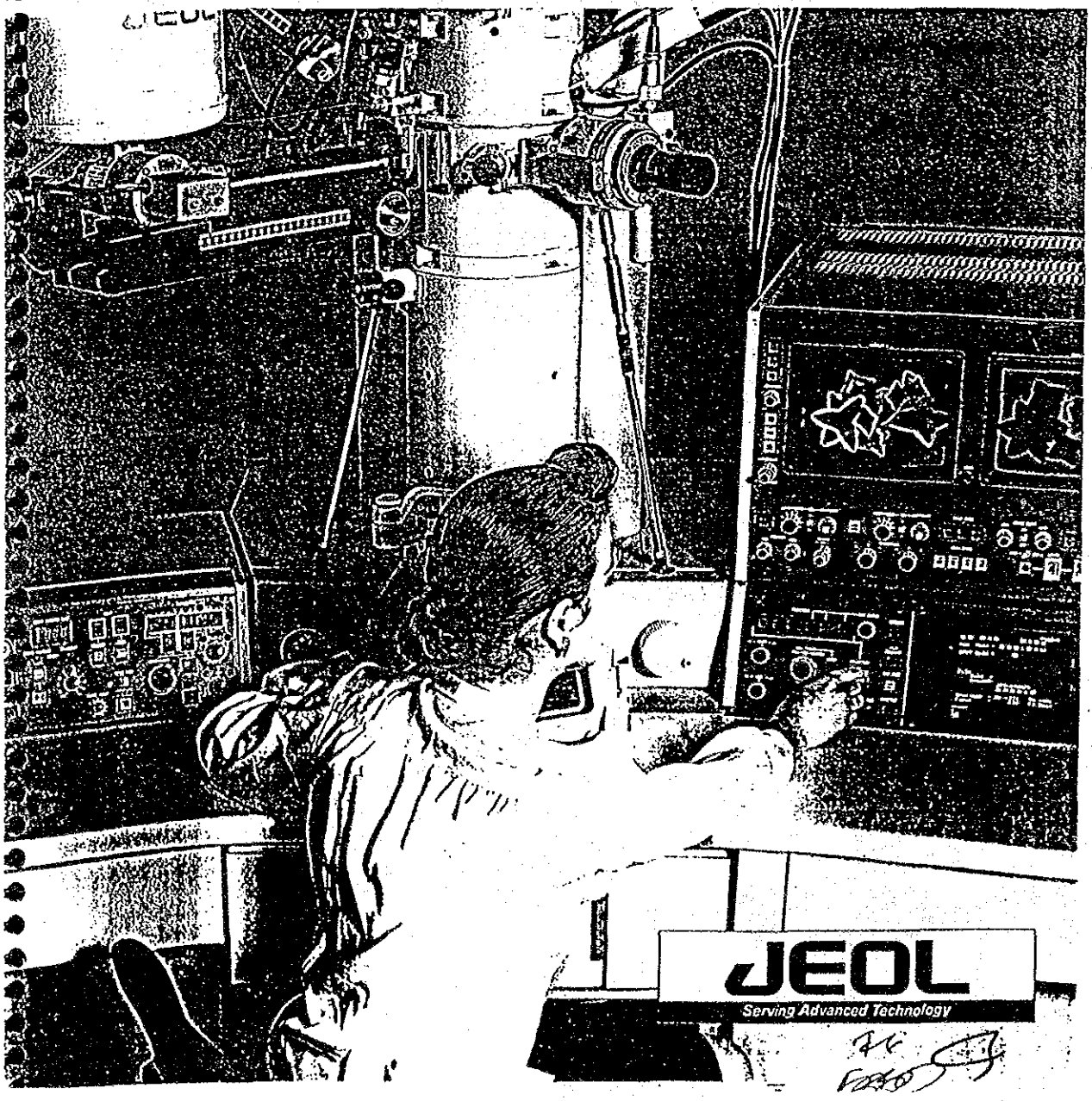
An infrared spectrophotometer whose price is at the level of one million yen. Needless to say, in addition to its low price, IR-408 is a high-performance instrument to maintain enough functions when performing qualitative / quantitative analysis.

- Wavelength range : 4000~650cm^{-1}
- Resolution : 4cm^{-1} at 1000cm^{-1}
- Wavenumber accuracy : ±10cm^{-1} from 4000~2000cm^{-1}
  ± 3cm^{-1} from 2000~650cm^{-1}

JEM-2000FXII

Electron Microscope

5



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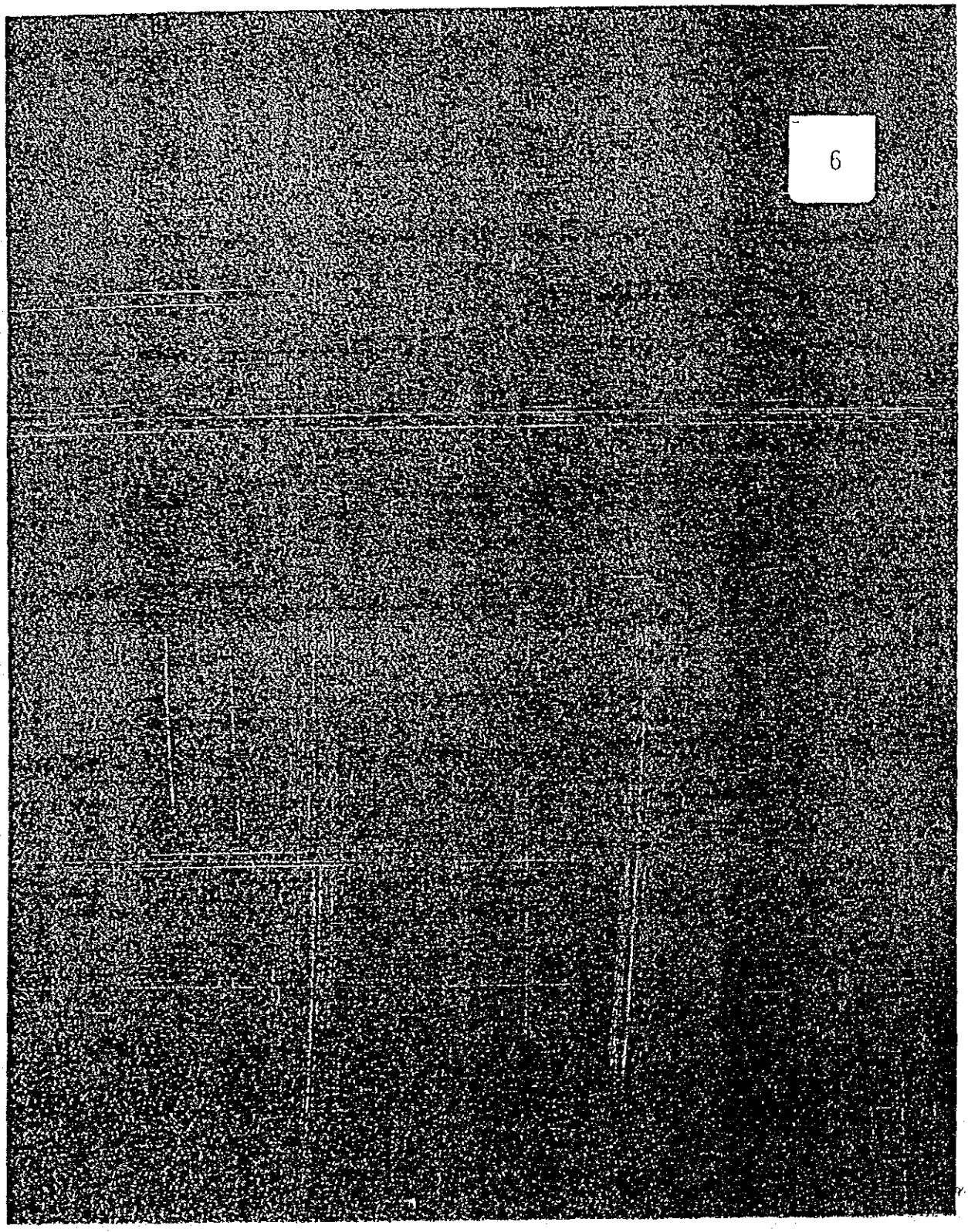
Struers Metallographic News 2/1989

LOGITECH
Materials Technologists & Engineers

19



Geological Sciences

In many areas of geological study such as mineralogy, petrography, sedimentology and so on, there is a need for samples to be examined microscopically. This is normally carried out using transmitted polarised light which creates a need for thin sections of known and exact thickness. Reflected light microscopy is also widely used for certain applications and this technique requires the surface of the sample to be flat and highly polished for the best results to be achieved. The increasing use of electron microscopes is also contributing to the need for top quality sections and thin sections of a wide range of materials. Logitech supplies a comprehensive range of equipment which satisfies all of these needs and which will allow the user to:

- produce the highest quality sections – consistently
- substantially increase section output
- virtually eliminate the need for hand lapping and polishing
- make sections from widely differing materials with equal ease
- make sections to widely differing dimensions with equal ease

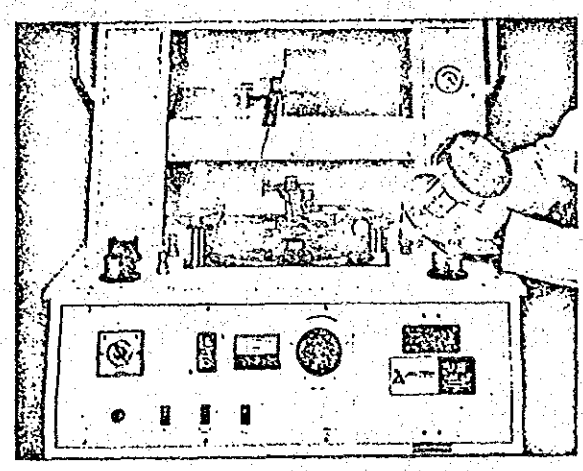
Whether the need is for Ultra Thin Sections down to 10 µm (0.0004")) or less, Thin Sections between 20 and 50 µm (0.0008" and 0.002")) or Polished Mounts, the following equipment, in appropriate combination, will satisfy the most stringent requirements.

Thin Section Production Systems

A range of systems is available to meet the needs of a wide variety of laboratory environments – from the small scale research project to full scale production. Systems are based on either the LP30 or PM2A machines, depending upon the individual customer's needs, but all systems share the same attribute – versatility. Production capacity can be expanded as demand for sections increases, quality of section is consistently high and a wide range of differing materials may be processed with equal ease. When combined with a CS10 saw and the IU20 vacuum impregnation unit, these systems provide a "state of the art" facility for thin section preparation.

Polishing Systems

Even the most difficult polishing applications can be satisfied by the WG2 Polishing System which offers both quality of results and versatility of performance.
Capable of producing the highest quality specimens, the WG2 is an ideal complement to a Logitech lapping system and is designed to provide the best quality surface finishes with the fastest possible production rates and the most economical operation.
In addition to the production of both polished sections and polished thin sections, the WG2 system may be adapted to the polishing of ultra-thin sections by the addition of a small range of operating accessories.



Petrographic thin rock section preparation using a PLJ2 Precision Lapping Jig. Slides are retained by vacuum for automatic parallel lapping to the desired thickness.

Polished thin section of essexite found on the South West coast of Scotland. The photomicrograph clearly shows a very high quality polish with minimal intergranular relief.

SYSTEM	28 × 48 mm		26 × 76 mm	
	standards	impregnated	standards	impregnated
PM2A lapping machine with single work station	60	40	45	30
LP30 lapping machine with single work station	60	40	45	30
LP30 lapping machine with two work stations	110	70	75	50
LP30 lapping machine with three work stations	150	100	100	70

Typical weekly production rates for standard quality petrographic thin sections (sections up to 110 × 76 mm can be produced with corresponding reduction in quantities.)

Combined Lapping and Polishing Systems

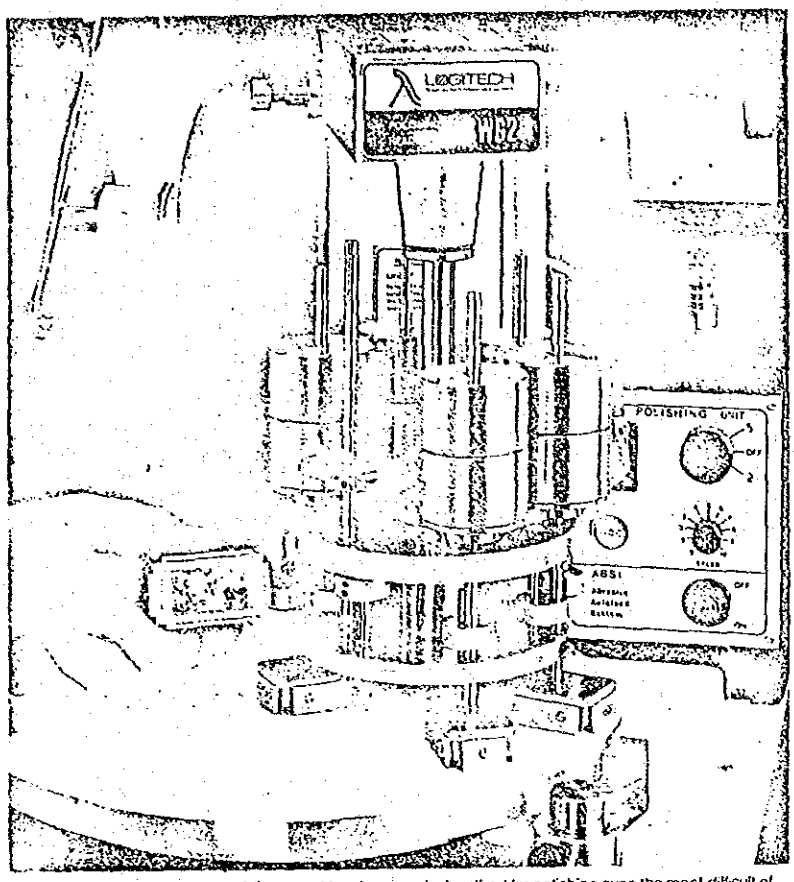
Occasionally, space, economics or simply low output requirements may preclude the use of separate systems for lapping and polishing and, in these circumstances, the RLP4 or RSP4 systems are ideally appropriate (RSP4 is identical to RLP4 with the addition of a CS10 saw).
Based on the PM2A(W) machine, both systems incorporate all of the features of a PM2A lapping system plus a WG2 polishing system, thus providing the ideal solution for laboratories with a small scale requirement for both lapped and polished sections.

Cut Off and Trim Saw Facilities

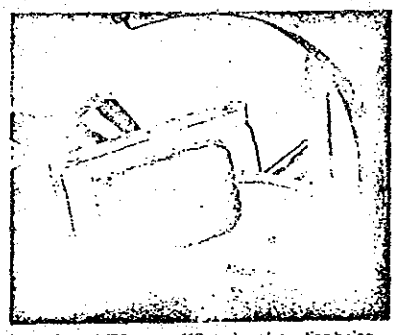
Thin section production normally requires that a slide mounted slice be thinned to 30 µm (0.0012") from a starting thickness of between 2 mm and 6 mm (0.08" and 0.25"). Although lapping must always be employed in the final stages, a more rapid process is required to remove the bulk of the excess material. The CS10 Thin Section Cut Off and Trim Saw is the ideal solution, automatically sawing off excess material from several sections simultaneously. The process lasts only a few minutes and does not require supervision, the resulting section is 300-500 µm (0.01-0.02") thick and is ready for final lapping.
For fragile materials the Model 15 Diamond Saw may be more appropriate. This is an extremely versatile saw which can be used either as a wire saw for extremely delicate cutting, or in fine diamond disc mode for those materials of intermediate difficulty.

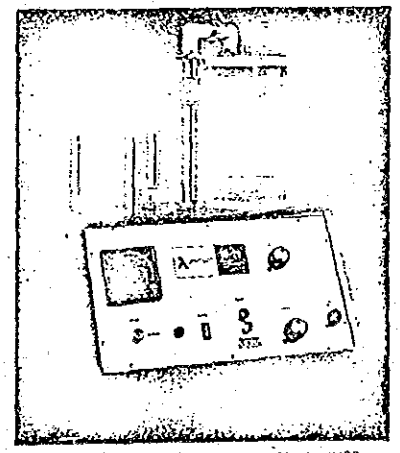
Impregnation

Many material types are too soft or friable for the production of samples from the raw state and the IU20 Vacuum Impregnation Unit was designed for consolidating these materials by impregnation with synthetic resins prior to sectioning. Utilising a unique double chamber arrangement, which allows both the sample and the resin to be evacuated separately, the IU20 enables even the most difficult of sample types to be satisfactorily impregnated, thereby greatly improving the quality of the finished specimen.



The WG2 polishing system, providing a rapid and economical method for polishing even the most difficult of geological materials.


Large format (76mm × 110mm) rock section being thinned to 300 µm prior to final lapping.


Oil rich drill chipping being outgassed in the IU20 vacuum impregnation unit prior to impregnation with a synthetic resin.


Model 15 saw in diamond disc mode being used to cut and trim a piece of granite prior to sectioning.

Whether the requirement is for large quantities of standard sections or small quantities of difficult ultra-thins, there is a suitable Logitech system available.

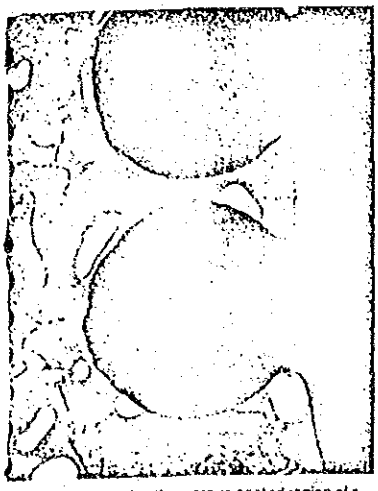
5

Other Applications

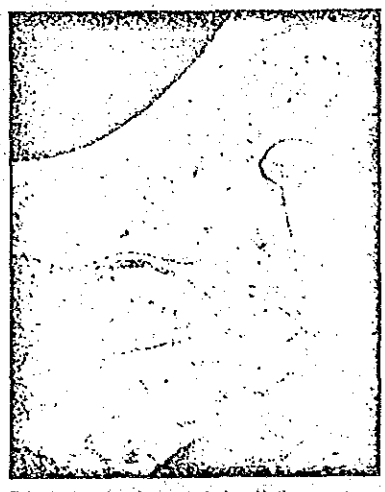
Following are just a few of the other applications where Logitech systems have provided real solutions to complex sample preparation problems. The list is by no means exhaustive, but when looked at in conjunction with the applications already described, it clearly illustrates both the high degree of flexibility of the equipment and the wide range of experience which Logitech offers in precision materials processing.

Calcified Tissues

Tooth: Thin sections of teeth provide an excellent tool for dental research and can be produced routinely using an appropriate Logitech system.
Every conceivable requirement can be met, from lapped sections in the 10-100 µm (0.003"-0.004") range for routine microradiography to polished thin sections of 10-15 µm (0.0004-0.0006") thick for detailed cellular analysis.
The techniques employed allow the use of encapsulated material or natural whole teeth and can be adapted to suit a wide range of differing applications.
Bone: Producing high quality thin sections of bone, with or without implants, using traditional microtome techniques presents major technological problems and generally results in sections of low quality which do not allow the scientist to properly evaluate the results.
Using a Logitech thin section production system, high quality thin sections to 10 µm (0.0004") or less and in formats up to 100 mm × 75 mm (4" × 3") can be produced routinely. The methods used are based on Logitech's standard thin sectioning techniques and are well proven.
Otoliths: In fisheries research, thin sections of otoliths are proving an increasingly useful tool in the analysis of periodic banding patterns for life history studies of fish. Working closely with a major US government department and utilising over 15 years experience in rock thin sectioning, Logitech has developed a successful method for volume production of otolith thin sections, which offers major advantages to the fisheries research scientist.

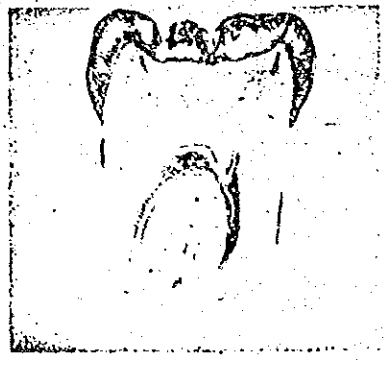


Thin section showing the porous coated region of a cobalt-chromium-molybdenum hip prosthesis taken from an entire cross section through the metal hip stem at 30x magnification.
Photo courtesy of Howmedica, New Jersey, U.S.A.



Thin section showing part of a bead in the porous coating of a knee prosthesis. 100x magnification.
Photo courtesy of Howmedica, New Jersey, U.S.A.

Thin section of otolith taken at 200x magnification
Section is 50 µm thick.
Photo courtesy of State of Washington Department of Fisheries, Olympia, USA



Thin sections of whole teeth, for microradiography
Sections are 80 µm thick.
Photographs courtesy of the Oral Biology Group of Glasgow Dental Hospital, Glasgow, Scotland

Metals

Preparation of some types of metals and alloys for ion beam milling and detailed structural analysis requires the production of very thin, 30 µm (0.0012") or less, highly polished and very uniform specimens. Traditional metallurgical polishing techniques do not readily satisfy these requirements and it is these areas of metallographic preparation in which a Logitech system can provide an effective solution.

Magnetic Recording Heads

Magnetic recording heads are commonly fabricated on 75 mm (3") diameter alumina/titanium composite wafers. Usually, there is a requirement to remove a few µm from the final evaporated coating which itself may be only 5 µm (0.0002") thick and a number of manufacturers use Logitech equipment for this stringent application.

Ceramics

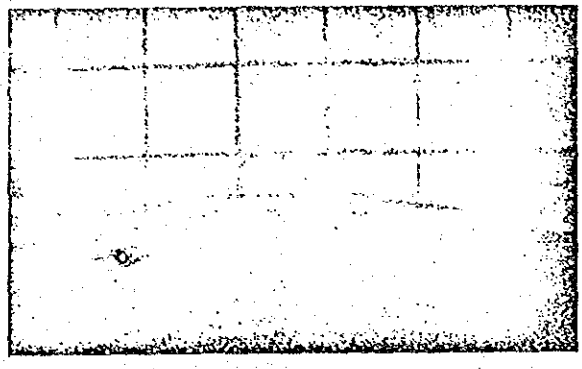
Device manufacture using ceramic substrates often involves the production of flat and/or thin layers of delicate and difficult materials such as PZT and lead oxides – another technology sector in which Logitech is a major contributor.

Polymers

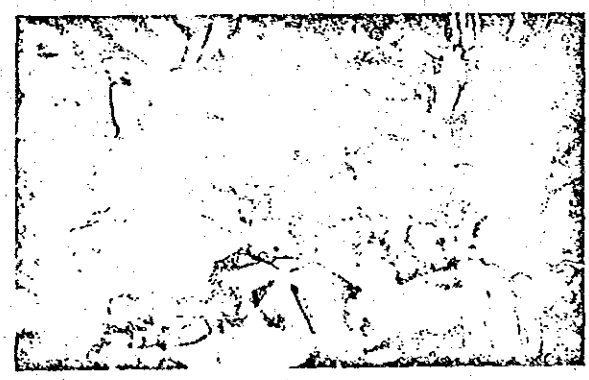
Structural defect and stress cracking analysis in polymers and carbon based materials presents another area where Logitech equipment is successfully used, providing a rapid and reliable method for polishing the ends of carbon fibres and for producing polished thin sections of a wide range of polymers at 30 µm (0.00012") or less in thickness.

There are many other interesting problems which have been solved using Logitech equipment and technology and the company is always willing to assist even in the more unusual applications.

Polished super alloy section taken at 500x magnification.



Magnetic recording head prior to polishing. 1500x magnification. *Photograph courtesy of LETI, CENG, Grenoble, France.*



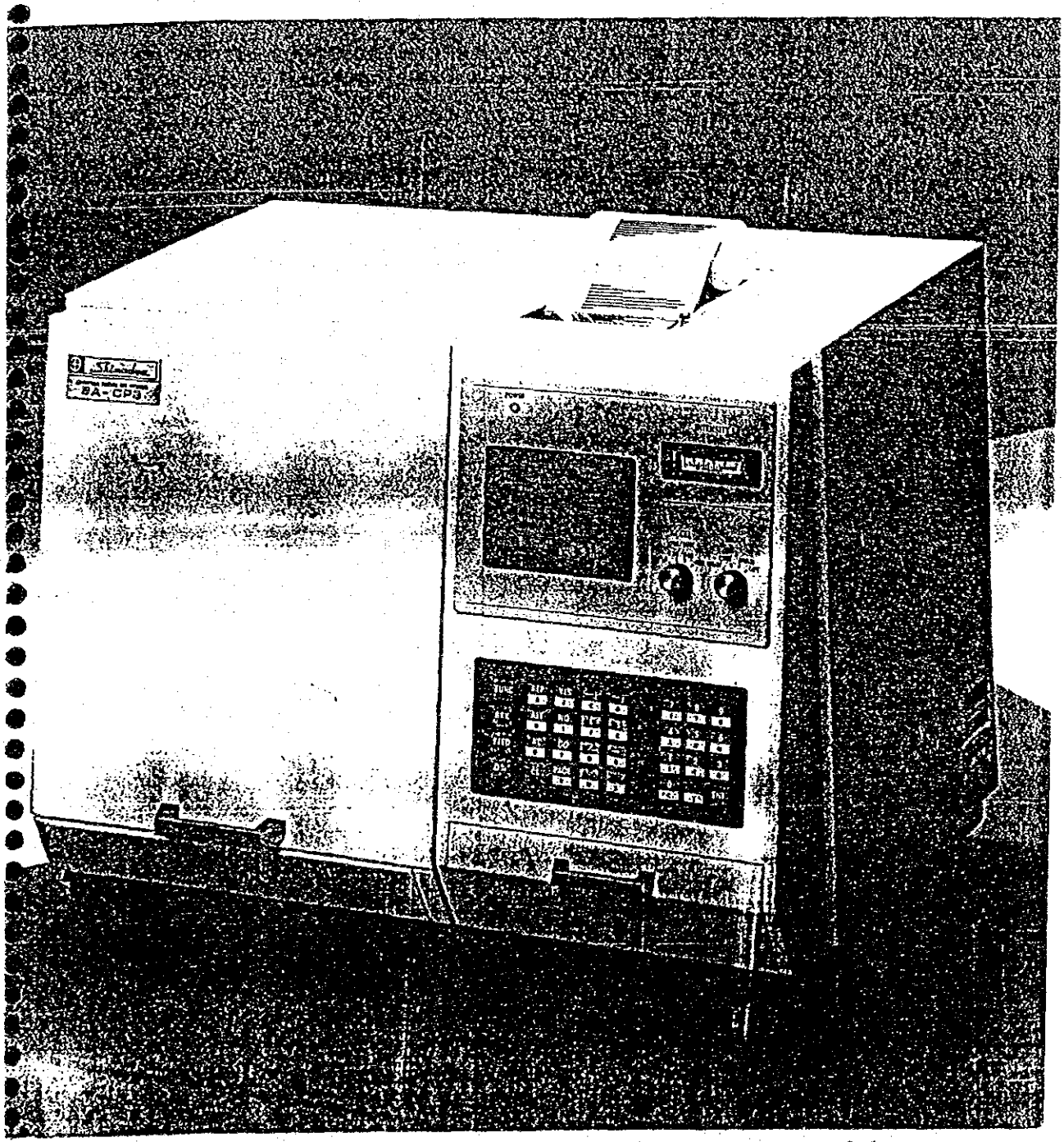
Thin section of pyroelectric ceramic. Viewed in transmitted, crossed, polarized light. Approx. grain size 2 µm. *Photo courtesy of Plessy Research Ltd., Caswell, U.K.*

Thin section of carbon fibre composite showing fracture after shear loading. Fibre diameter is 7 µm. *Photograph courtesy of ICI Advanced Materials, Cleveland, U.K.*

8

SA-CP3

SHIMADZU CENTRIFUGAL PARTICLE SIZE ANALYZER



SPECIFICATIONS & PERFORMANCE

Method:
Gravitational and/or centrifugal sedimentation and photometric detection
Measuring Range:
0.02 ~ 500 μm (Depends on the particle density, the density and viscosity of dispersant, and other conditions.)
Measuring Mode:
Gravitational sedimentation, centrifugal sedimentation, multi (combination of gravitational sedimentation and centrifugal sedimentation), and centrifugal lift.
Suspension Concentration:
Below 0.1 wt% (Differs with sample)
Type of Data (to be printed out):
(1) Cumulative particle size distribution ··· table and graph (oversize-undersize selection possible)
(2) Differential particle size distribution ··· table and graph
(3) Measuring time
(4) Absorbance
(5) Percentage of selected particle diameters (up to 5 points)
(6) Diameter of selected percentage (up to 2 points)
(7) Median diameter
(8) Modal diameter
(9) Specific surface area
Plotting Step:
(1) Fixed: In a progression of 1, 1.5, 2, 3, 4, 5, 6, 8 (in diameter)
(2) Arbitrary: Desired particles are entered via the keyboard. (Switch selection of (1) and (2)).
Optical System:
- Light source: Halogen lamp, 6V, 10W
- Slit: 3
- Filter: A heat ray cut filter and a green filter
- Lens: Two optical lenses
- Photo sensor: Silicon photocell

Centrifuge Unit:
- Driving motor: Brushless D.C. motor, 100V D.C., 50W
- Rotation mode:
  (1) Constant rotation ··· The speed is set via the keyboard in a range from 500 rpm to 5000 rpm.
  (2) Accelerated rotation ··· Rotation increases from 500 rpm at a rate of 120 rpm/min., 240 rpm/min., or 480 rpm/min.
- Maximum rotation: 5000 rpm (The safety switch operates at 5120 rpm.)

Measuring Cell:
- External dimensions: $21^{W} \times 14^{D} \times 52^{H}$ mm
- Inner volume: About 6 cm^3 (3 cm^3 in necessary suspension volume)
- Material: Quartz glass (with a fluoro resin lid)
- Applicable measuring mode. All the four modes.

CRT:
- Type: 5.5 inch, green
- Display: 40 characters x 20 lines

Printer:
- Type. Thermal printer, line-dot type
- Chart width: 110 mm
- Printing speed: About 0.5 sec./line

Keyboard:
- Kind: Numerical keys, function keys, symbol keys (alphabets can be entered).

Signal Output:
- Method: RS-232C, serial
- Transmission speed: 300, 600, 1200, 2400 baud

Ambient Temperature Range:
15 ~ 35°C
Dimensions and Weight:
600 ($23\frac{5}{8}$")^{W} x 400 ($15\frac{3}{4}$")^{D} x 460 ($18\frac{1}{8}$")^{H} mm, 60 kg
Power Requirements:
AC 100, 110, 120, 200, 220 or 240 V as ordered.
300 VA (rated), 50/60 Hz
Standard Accessories:
- Measuring cell: 1
- Lid for cell: 1
- Plastic sheet cover: 1
- Brush for cleaning cell: 1
- Chart paper for printer: 3 rolls
- Fuse: 2
- Hex key wrench: 2

SA-AS1 Automatic Sampler (option):
- Stirring Unit
  Type: Rotary vane type
  Revolution: 0 ~ 600 rpm
- Circulation pump
  Type: Tube pump
  Delivery: About 250 mℓ/min.
- Flow-thru cell
  External dimensions: 23 ($\frac{7}{8}$")^{W} x 14 ($\frac{1}{2}$")^{D} x46 ($\frac{3}{4}$")^{H} mm
  Inner volume: 5.6 cm^3
  Measuring mode: Gravitational sedimentation
- Dimensions and weight
  240 ($9\frac{3}{8}$")^{W} x 280 (11")^{D} x 900 ($35\frac{3}{8}$")^{H} mm, 10 kg
- Power requirements: AC 100V, 100VA, 50/60Hz, supplied from the SA-CP3

Ordering Information

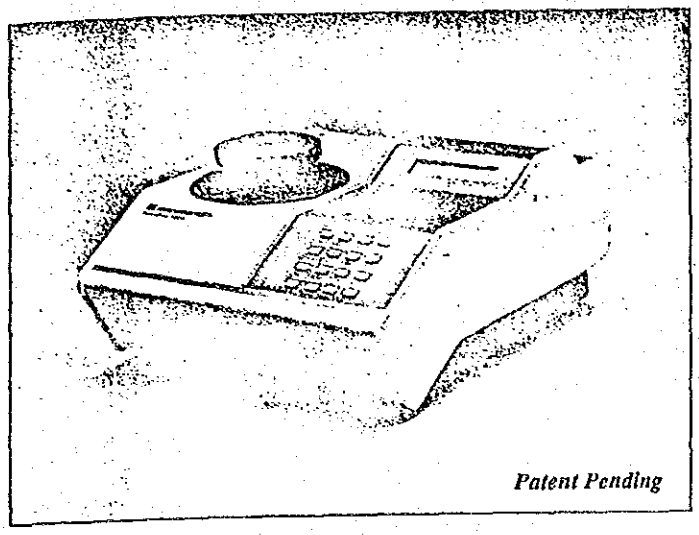
Cat.-No.	Equipment
321-45432-10	SA-CP3
321-38301	SA-AS1*
321-45432-20	SA-CP3 with SA-AS1

* The SA-AS1 is dedicated to the SA-CP3.

11

micromeritics®

AccuPyc 1330



Patent Pending

Feature	Benefits
Ultra-High Precision and Repeatability	• Fewer repeat measurements are needed. • More applications are possible. • May be confidently used to control processes.
RS-232 Interface	• Allows data transmission to archival devices. • Produces ASCII data, which can be used as input to spreadsheet programs.
Automatic Operation	• Saves time and increases efficiency of operation because of greater reproducibility of measurements.
Fast (2-3 minutes)	• Saves time and produces timely information for process guidance.
User-Programmable Running Conditions	• Widens applications and ensures knowledgeable user's ability to guide technician's work.
User-Changeable Modules	• Removes most limits imposed by sample size on attainable precision. • Permits samples to remain intact and to be run whole. • Minimizes sample errors due to inhomogeneity since larger quantities can be analyzed.
Printer Option	• Provides permanent record. • Eliminates transcription errors. • Minimizes labor.
Automatically Repeated Runs	• Avoids errors due to thermal and moisture problems.
Portability	• Readily moved to required location.

The AccuPyc 1330 Pycnometer is a fast, fully-automatic device for determining the density of solids. It has ten times the precision and accuracy of any other helium pycnometer. Analyses are initiated with a keystroke. Data are collected, calculations performed, and results accurately and precisely displayed without further operator intervention.

The AccuPyc 1330 is controlled by commands entered through the keypad. The status of each operation is shown in the display area. Innovative software allows in-depth English, French, Spanish, or German reporting.

Reports are generated after analysis or calibration and remain available for viewing or printing until another automatic operation is performed. Partial reports may be printed or transmitted while an operation is in progress.

Micromeritics' unique run precision option maximizes instrument throughput by automatically terminating an analysis after five successive measurements are within a user-specified tolerance. Statistical data from these analyses often reflect greater precision because only measurements from the last five runs are used in the computation.

The AccuPyc 1330 RS-232 interface transmits data to a computer using the standard ASCII file format. Once captured, the data can be used as input to popular spreadsheet or data manipulation programs.

PORESIZER 9310 SPECIFICATIONS

STANDARD PENETROMETERS

Intrusion Volume:	0.38, 1.1, 1.8, 3.2 or 4.1 cc
Sample Capacity:	3, 5 or 15 cc for both solid and powder samples
Largest Solid Sample:	Right cylinder 26-mm diameter x 26-mm long

LOW PRESSURE MEASUREMENT

Vacuum Gauge:	Nominal 0-1000 μm Hg
Transducer:	0.21 MPa (0-30 psia)
Resolution:	±0.001 MPa (±0.1 psia)
Transducer Accuracy:	±1.0% of Full Scale

HIGH PRESSURE MEASUREMENT

Transducer Ranges:	0-207 MPa (0-30,000 psia)
Resolution:	±0.01 MPa (±1 psia)
Transducer Accuracy:	±1.0% of Full Scale

INTRUSION/EXTRUSION READOUT

Resolution:	Better than 0.5 μL
Accuracy:	±1% of maximum pentrometer volume

POWER REQUIREMENTS

Uses standard electrical power worldwide.

Voltage:	100/120 or 220/240 VAC ±10%
Current:	2.5A (100/120 VAC); 1.25A (220/240 VAC)
Frequency:	50/60 Hz

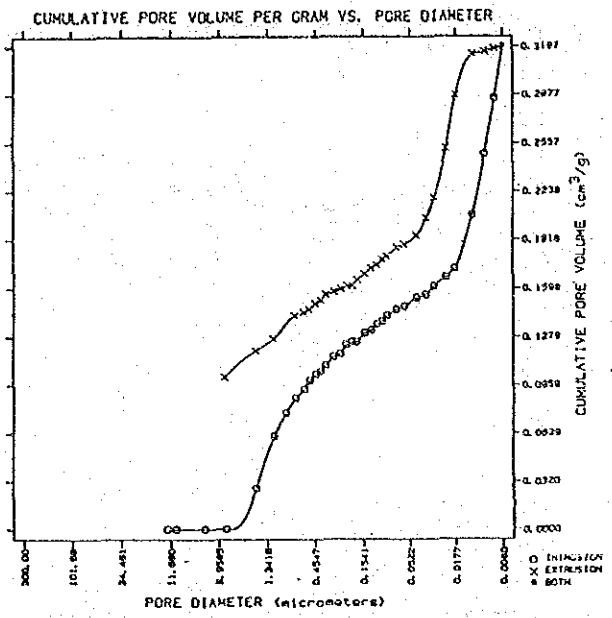
CABINET

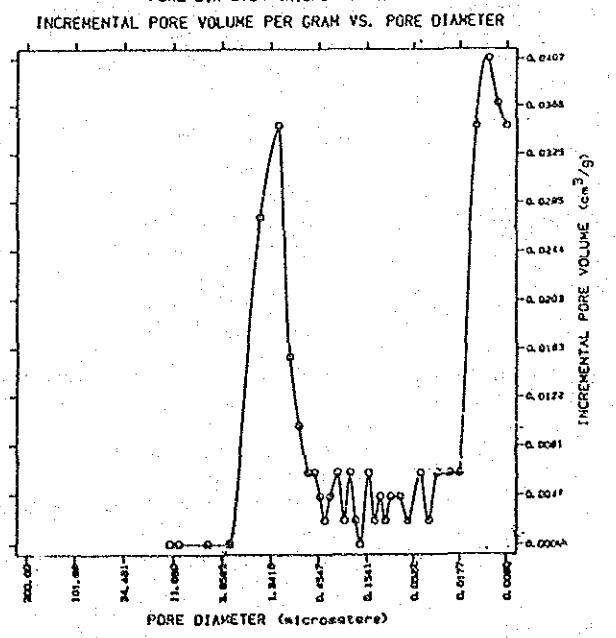
Dimensions:	58.5W x 79.5H x 55D cm (23W x 31H x 21.6D in.)
Color:	Cream with brown panel and rust trim.
Weight:	86 Kg (190 lbs)

INTERFACE

RS-232-C connector for computerized data collection.

Baud Rate:	1200





micromeritics

Micromeritics Instrument Corporation

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931/42701/0

SHIMADZU

データ処理機能つき

荷重自動変換式 島津微小硬度計

HMV-2000

MICRO HARDNESS TESTER