Contents

1.Introduction

Material Analysis Center (MAC), the predecessor of Comprehensive Analysis Center (CAC), had been established in 1977 as an affiliated facility of The Institute of Scientific and Industrial Research (ISIR). CAC, with the reorganization of MAC integrating the former Electron Microscope Room, was established in 2009 as a common comprehensive facility to support a wide range of basic and applied research fields in ISIR. CAC staffs consist of 1 associate and 2 assistant professors (as full-time professors), 4 technical staffs, 2 part-time staffs, 1 associate professors (concurrent post), 4 assistant professors (concurrent post) and 1 director (concurrent post).

Fortunately, immediately after the renewal, CAC could update many of decrepit instruments to globally advanced instruments by obtaining a supplementary budget in 2010 to be equipped with observation instruments including component and surface analyzers, spectrometers and electron microscopes, shown in this booklet, to comprehend various research fields in ISIR. The instruments are maintained and managed by CAC staffs to allow users to utilize at any time. CAC staffs support analyses by utilizing instruments required expertise and each researcher can utilize easily operable instruments all day. Lectures for instrument users, including instrumental analysis lectures for new students, is vigorously held every year. Fully utilize the instruments in CAC if you read this booklet and/or CAC users' guide.

CAC is an ISIR-affiliated common facility and primarily positioned as a research support facility in ISIR. Additionally, CAC enhances cooperation with collaborative research facility networks centering on Center for Scientific Instrument Renovation and Manufacturing Support, Osaka University. CAC users consisting of intramural and extramural researchers and Incubation Building-located company workers are currently increasing. CAC was highly evaluated by external evaluations held in 2012 as "an open facility which is a model case in Japan and Osaka University should be proud of".

Above-mentioned performance related to university-wide supports of education and research was recognized in 2015. An expenditure of CAC-proposed project "promotion of university-wide education for material state analysis" has been supported by presidential discretionary expenditure (intensive promotion expenditure for education and research). All CAC staffs make further efforts to effectively utilize the expenditure to allow all users to give excellent research results. The CAC full-time professors conduct their original research related to organic, physical organic and analytical chemistry by fully utilizing instruments in CAC. Additionally, CAC staffs vigorously participate in opening CAC to the public (Icho Festival), tours for high school students and introduction activity of advanced instruments and research.

CAC staffs would appreciate the understanding and cooperation of all users' for maintenance and development.

2.Staff List

Position	Name	Affilation	Extension	E-mail	Room No Annex of Research Buildings
Director	Takahiro Kozawa	Department of Beam Materials Science	8500	kozawa[*1)]	F570
Associate Prof.	Takeyuki Suzuki	Comprehensive Analysis Center (CAC)	8525	suzuki-t[*1)]	205-1
Assistant Prof.	Dayang Zhou	Comprehensive Analysis Center (CAC)	8526	zhou[*1)]	206
Assistant Prof.	Kaori Asano	Comprehensive Analysis Center (CAC)	8527	asano[*1)]	206
Assistant Prof.	Mitsuko Nishino	Department of Biomolecular Science and Regulation	8545	mnishino[*1)]	F341
Assistant Prof.	Makoto Sako	Department of Synthetic Organic Chemistry	8466	sako43[*1)]	F407
Associate Prof.	Hideto Yoshida	Department of Nanocharacterization for Nanostructures and Functions	8431	h-yoshida[*1)]	S411
Assistant Prof.	Tomoyo Goto	Department of Advanced Hard Materials	8436	goto[*1)]	S605
Assistant Prof.	Seihou Jinnai	Department of Soft Nanomaterials	8476	jinnai[*1)]	F506
Staff	Tsuyoshi Matsuzaki	Technical Division	8527	matuzaki[*1)]	302
Staff	Hitoshi Haneoka	Technical Division	8526	haneoka[*1)]	206
Staff	Yosuke Murakami	Technical Division	8531	murakami[*1)]	S105
Staff	Tsunayoshi Takehara	Technical Division	8528	takehara[*1)]	206
Staff	Takeshi Ishibashi	Comprehensive Analysis Center (CAC)	8531	isibasi[*1)]	S105
Staff	Nao Eguchi	Center for Scientific Instrument Renovation	4782	eguchi-n[*2)]	I405
Assistant Administrative Staff	Etsuko Mori	Comprehensive Analysis Center (CAC)	8529	cac-secretary[*1)]	201

*1) @sanken.osaka-u.ac.jp *2) @reno.osaka-u.ac.jp


T. Kozawa


T. Suzuki


D. Zhou


K. Asano


M.Nishino


M. Sako


H. Yoshida


T. Goto


T. Matsuzaki


H. Haneoka


Y. Murakami


T. Takehara


T. Ishibashi


N. Eguchi


E. Mori

3.Instrument List

Instrument Name	Model (Maker) Name	Measurement Method		For Self Measurement			Installation Room *2)	Details	Staff
		Request	Self	Special Guidance	Reservation	Overtime Utilization *1)			
Nuclear Magnetic Resonance 700 MHz	Avance Ⅲ-700 (BRUKER)	○			Available	Available	105	5	D. Zhou H. Haneoka
Nuclear Magnetic Resonance 600 MHz	Avance Ⅲ-600 (BRUKER)	○					104	5	
Nuclear Magnetic Resonance 600 MHz	ECA-600 (JEOL)	○	○	Required			106	6	
Nuclear Magnetic Resonance 400 MHz	ECS-400(JEOL)		○	Required			F428	6	M. Sako
Nuclear Magnetic Resonance 400 MHz	ECS-400(JEOL)		○	Required			F507	6	S. Jinnai
Mass Spectrometer	JMS-600H (JEOL)		○	Required	Available	Available	303	7	K. Asano T. Matsuzaki
	JMS-700(JEOL)	○					303	7	
	AccuTOF-DART(JEOL)		○	Required	Available	Available	303	8	
	Ultraflex Ⅲ (BRUKER)		○	Required	Available	Available	304	8	
	micrOTOF Ⅱ (BRUKER)	Negotiable					304	9	
	LTQ Orbitrap XL(THERMO)	○					304	9	
	ITQ1100(THERMO)		○	Required	Available	Available	304	10	
Secondary Ion Mass Spectrometer	SIMS4100(ATOMIKA)		○	Required	Available	Available	102	10	N. Eguchi
Infrared Spectrophotometer	FT/IR4100(JASCO)		○	Required	Available	Available	302	11	T. Suzuki H. Haneoka
	React-IR45 (METTLER)	Negotiable	○		Available	Available	302	11	
Ultraviolet-visible Spectrophotometer	V-770(JASCO)		○	Required	Available	Available	302	12	
Polarimeter	P-2300(JASCO)		○	Required	Available	Available	302	12	
Circular Dichroism spectrometer	J-1500(JASCO)		○	Required	Available	Available	302	13	
Inductively Coupled Plasma Spectrometer	ICPS-8100(SHIMADZU)		○	Required	Available	Available	301	13	N. Eguch H. Haneoka
CHN Element Analyzer	2400(PERKIN-ELMER)	○					302	14	T. Matsuzaki
	JM10(J-SCIENCS)	○					302		
Differential Thermal Balance	TG8120(RIGAKU)		○	Required	Available	Available	302	15	T. Takehara
Differential Scanning Calorimeter	DSC8270(RIGAKU)		○	Required	Available	Available	302	15	

Instrument Name	Model (Maker) Name	Measurement Method		For Self Measurement			Installation Room *2)	Details	Staff
		Request	Self	Special Guidance	Reservation	Overtime Utilization *1)			
X-ray Microanalyzer	JXA-8800R(JEOL)	○	○	Required	Available	Available	102	15	N. Eguch
Scanning Electron Microscope	JSM-6335F(JEOL)	○	○	Required	Available	Available	S107	16	Y. Murakami N. Eguch
Transmission Electron Microscope	JEM-ARM200F(JEOL)	○					S104	16	M.Nishino H. Yoshida
	JEM-2100(JEOL)	○	○	Required	Available	Available	F192	17	Y. Murakami T. Ishibashi
Nanoscale Hybrid Microscope	VN-8010(Keyence)		○	Required	Available	Available	S107		Y. Murakami
X-ray Photoelectron Spectroscopy	JPS-9010(JEOL)		○	Required	Available	Available	101	17	H. Haneoka
X-ray Diffractometer	SmartLab(RIGAKU)	*3) ○	○	Required	Available	Available	101	18	T. Takehara
X-ray fluorescence	ZSX100e(RIGAKU)		○	Required	Available	Available	101	18	T. Goto
X-ray Diffractometer for Single Crystals	XtaLAB PRO(RIGAKU)	○	○	Required	Available	Available	203	19	T. Takehara
	FR-E RAPID191R(RIGAKU)	○	○	Required	Available	Available	203		
	FR-E R-AXIS Ⅳ++(RIGAKU)		○	Required	Available	Available	203		

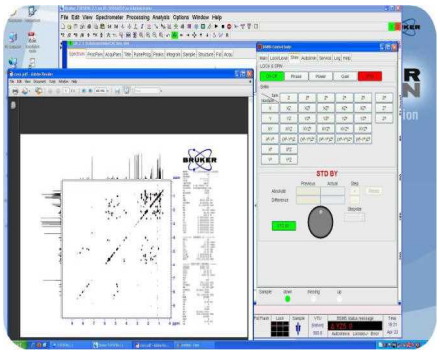
*1) “Overtime Utilization” means utilization of CAC expect 8:30-18:00 on weekdays.
(See p.21 for details)

*2) See Floor Map (p.29)

*3) We only accept particular maesurements.

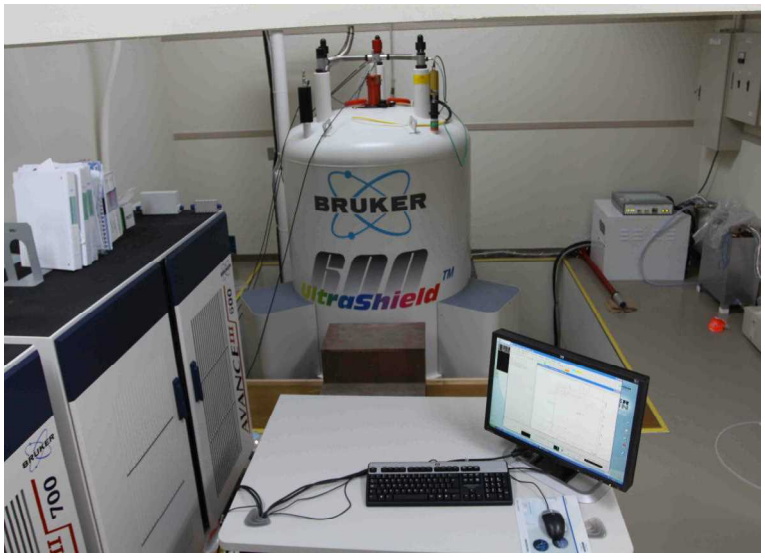
4.Summary of Instruments

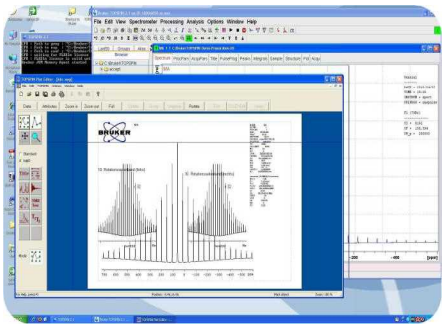
Nuclear Magnetic Resonance 700MHzNMR



AVANCE III 700, a high resolution NMR spectrometer of Bruker BioSpin, is an advanced digital NMR device at the highest sensitivity. Combination of cryoprobes enables supersensitive NMR measurement. The spectrometer has supersensitive triple resonance probes for ^{1}H, ^{13}C and ^{15}N, which optimizes ^{1}H and ^{13}C nuclear measurements, enables high sensitive and rapid 2D and 3D measurements, and remarkably shortens measurement time. The spectrometer has automatic tuning/matching functions and enables fully automatic measurement with rapid and high resolution by simultaneously using sample changers, which is applicable to the various fields including pharmaceutics, biotechnology, organic chemistry,

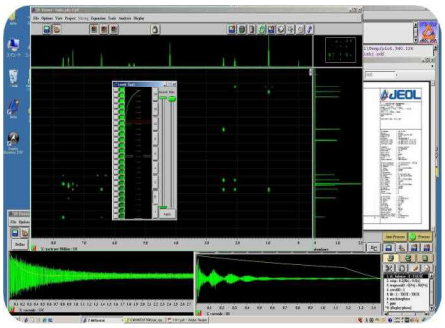
Nuclear Magnetic Resonance 600MHzNMR(solid)





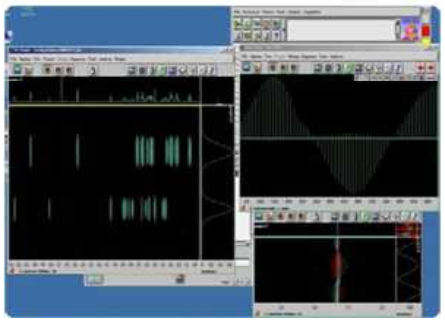
AVANCE III 600WB, the latest solid NMR spectrometer of Bruker BioSpin, has a wide bore magnet, which enables measurement variable-temperature from -140 to +150°C. Combination of 4-mm CPMAS probes and very fast rotary 1.3-mm CPMAS probes enables proton, multinuclear and 2D NMR measurements difficult for conventional spectrometers. The solid NMR spectrometer at the highest level is applicable to the various fields including material science, life science etc. and determination of solid catalysts.

Nuclear Magnetic Resonance 600MHzNMR



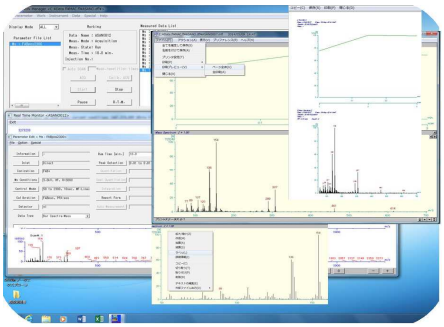
JNM-ECA 600, developed by Japan Electron Optics Laboratory (JEOL), is an FT-NMR spectrometer using the advance digital technology and high frequency. Automatic tuning and matching of JNM-ECA 600 MHz NMR enables gradient shim. The spectrometer easily provides NMR spectra with high reproducibility and quality. The water signal elimination and differential spectrum measurements are also easily measurable. Low frequency probe is also equipped. The spectrometer is applicable to determine the sign of rhodium and has an MICCS instrument enabling reaction tracing measurement.

High-sensitive Magnetic Resonance Spectrometer 400MHzNMR



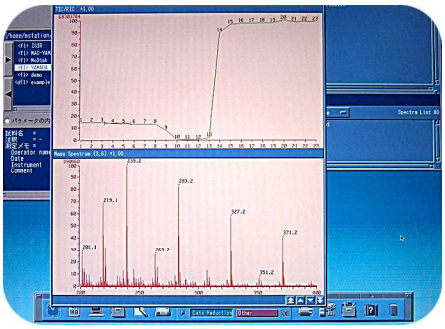
Two high performance magnetic resonance spectrometers (JNM-ECS 400), developed by Japan Electron Optics Laboratory CO., LTD (JEOL), are smaller size two channels spectrometers for solutions. The spectrometers with space-saving design have SCMs with compact magnetic field. The spectrometers with excellent stability exhibits remarkable effect on elimination of solvent signals and on differential spectrum measurement. The spectrometers are originally equipped with auto-tuning probes which enable to cleanly, quickly and easily measure various NMR spectra. The spectrometers are equipped with data processing software Delta which enables to easily and freely process data. Users also can process NMR data by using analytical software such as Delta, Net Alice etc. through theirs PC in the ISIR.

Mass Spectrometer FAB-MS (JMS-600)



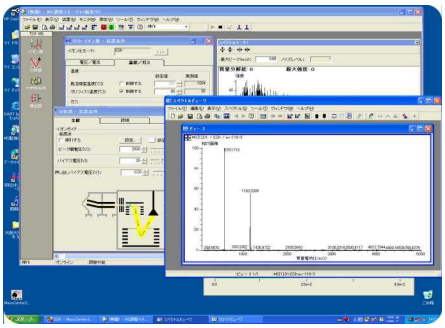
Fast atom bombardment (FAB) is an ionization technique that the high energy neutral atoms collide with the molecules of material to create ions. The substances of material to be analyzed are mixed with the non-volatile chemical solvent called a “matrix” like m-NBA (3-nitrobenzyl alcohol) commonly used for a standard. And the molecules of the substances are “bombarded” under high-vacuum with a high energy (3 to 10 kV) by the atoms accelerated at high speed and collided. The atoms are typically from an inert gas such as argon (Ar) or xenon (Xe). This instrument in here is applied to low-resolution measurement, and ions can be detected easily. Also it’s usually suitable for *hardly volatile* compounds with mass range of 100-800 m/z.

Mass Spectrometer FAB-MS (JMS-700)



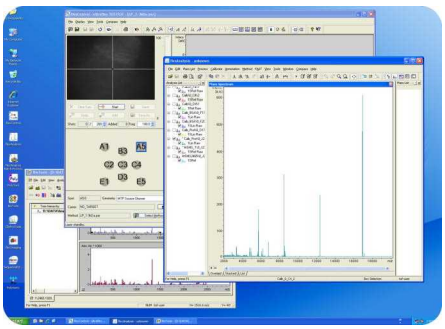
This JMS-700, developed by JEOL, is the reverse geometry (BE geometry) double-focusing mass spectrometer of the magnetic field preceding type by which the ion optics system consists of a magnetic field and an electric field. That's the successor model of forward geometry (EB geometry) analyzer JMS-600H, and that can tune parameters about condition automatically. Chemical composition can be presumed because of its good-sensitivity and high resolution.

Mass Spectrometer DART-SVP-MS



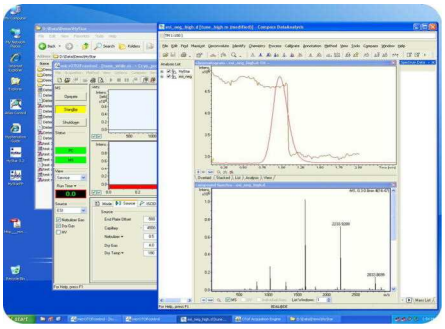
This mass spectrometer has DART (Direct Analysis in Real Time) ion source developed by IonSense Inc., which is interfaced to AccuTOF ™ ESI-TOF mass spectrometry developed by JEOL. DART is an atmospheric pressure ion source that instantaneously ionizes gases, liquids and solids in open air under ambient conditions. It is one of the first Ambient-Ionization techniques. Ambient ionization is a form of ionization in which ions are formed in an ion source outside the mass spectrometer without sample preparation or separation. So, solid and liquid materials can be analyzed by mass spectrometry in their native state.

Mass Spectrometer MALDI-MS



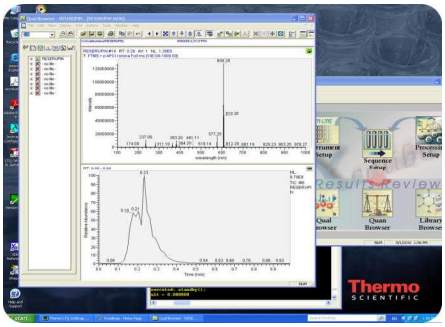
Ultraflex III ™ developed by Bruker Daltonics has Smartbeam ™ as a laser beam to largely enhance sensitivity and resolution. The focus diameter (10 ~ 80 μm) of the laser is possible to control by PC. By using a minimal laser focus, a sample of tissue section can be scanned by a very high pixel in MALDI imaging measurement. And spectral data are obtained with high-sensitivity and high-resolution. The Normal measurement of the spectrometer exhibits a wide mass range of 1 - 500,000 m/z and a high resolution of 25,000 by using PAN ™ (Panoramic) technology.

Mass Spectrometer CSI-MS



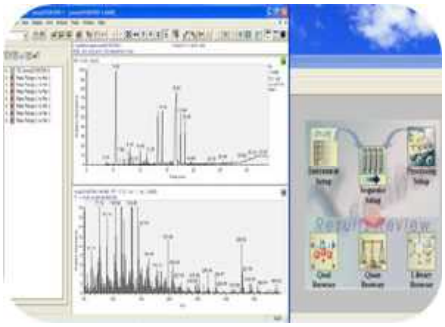
This spectrometer has the micrOTOF-II™ combining cold-spray or cryospray ionization developed by Bruker Daltonics, which enables ESI-TOF (electrospray ionization time-of-flight) mass-spectrometry measurement under cooled conditions to the high sensitivity and the high-resolution; mass accuracy: 1-2 ppm, mass resolution: 16,500 and measurable mass range: 50 ~ 20,000 m/z . The spectrometer is suitable for organic structures which are unstable at room temperature or sensitive to ambient air: organometallic complexes, supramolecular complexes and reactive intermediates etc..

Mass Spectrometer FT-MS



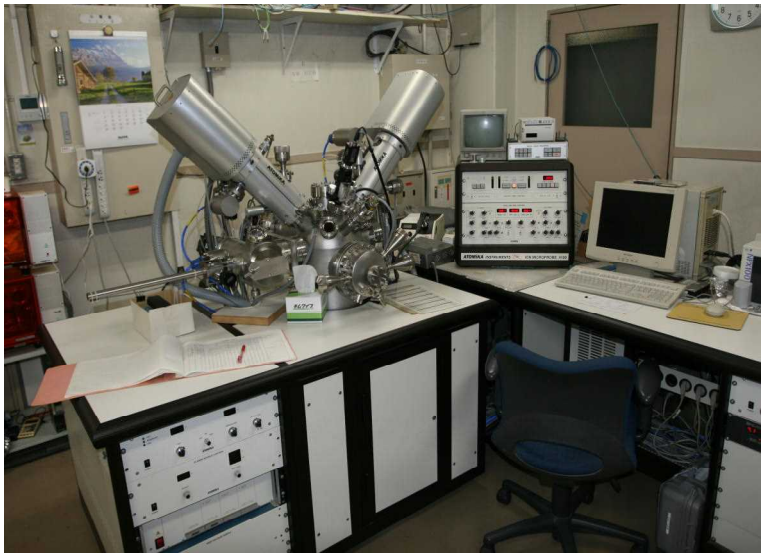
The Thermo Fisher Scientific LTQ Orbitrap XL™ Hybrid Ion Trap-Orbitrap Mass Spectrometer is a Fourier Transform Mass Spectrometer (FTMS) based on Thermo Fisher Scientific LTQ XL™ linear ion trap and Orbitrap mass spectrometer technologies. The spectrometer has high performances with high resolution (60,000 @m/z 400 of resolution), mass range (50-2000, 200-4000 m/z), high mass accuracy (3 ppm), high sensitivity, and dynamic range. Those enable profiling of low-abundance metabolites in complex mixtures and also profiling of protein at multistep MS/MS. ESI, APCI and APPI ionizations are selectable and a wide range of samples is measurable at the highest level.

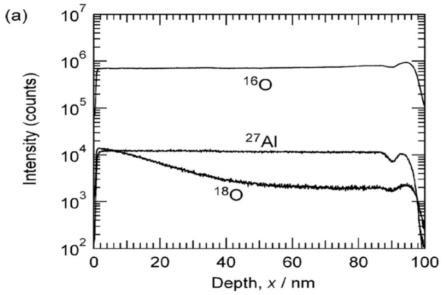
Mass Spectrometer GC-MS



A member of the Thermo Fisher Scientific ITQ™ Series of GC-ion trap mass spectrometers, the ITQ 1100™ GC/MS^n (measurable mass range: 10-1100 m/z) enables MS^n (MS/MS, $n \leq 5$). The ITQ 1100 has new advanced scan-function of "ACE (Automated Collision Energy) and PQD (Pulsed Q Dissociation Mode)". The advantages of its functions are easier to optimize analysis and data quality is improved. It acquires full scan and MS^n data in a single acquisition simultaneously. ITQ 1100 restores the performance without venting by using the standard vacuum probe interlock.

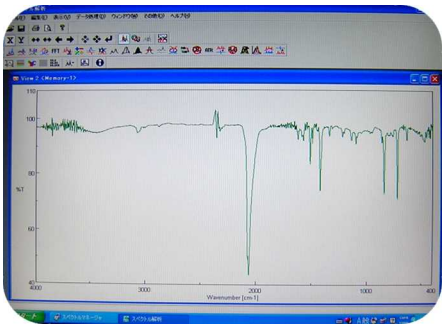
Secondary Ion Mass Spectrometer SIMS4100





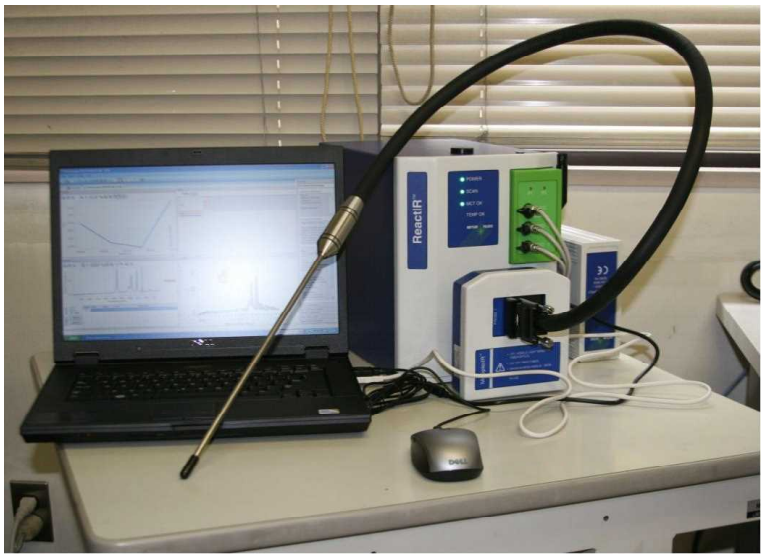
This secondary ion mass spectrometer, developed by ATOMIKA, irradiates primary ion beams to solid surfaces of samples. A quadrupole mass spectrometer in the spectrometer detects secondarily released ions by sputtering. Mass spectrometry of secondary ions enables highly sensitive (ppm-ppb) identification of constituent elements of the samples on the solid surfaces. Appropriately using oxygen or cesium as a primary ion source corresponding to analyzed elements affords depth-directional distribution of the elements by measuring chronological changes of intensity of secondary ion signals.

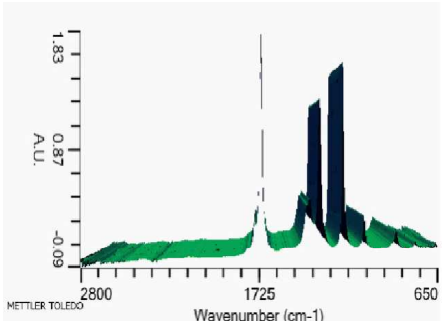
Fourier Transformation Infrared Spectrophotometer FT-IR



This compact infrared spectrophotometer Fourier-transforms interference waves by PC, which has high sensitivity, stability and easy operability and is suitable for routine analysis. The spectrophotometer has ATR (Attenuated Total Reflection) measuring instrument, which is applicable to film and powder samples. The spectrophotometer enables middle, near and far infrared measurements, which afford infrared absorption spectra from a wide range of both inorganic and organic samples. Furthermore, the spectrophotometer is applicable to rapid scanning and imaging measurements, which enables to utilize for research and material development.

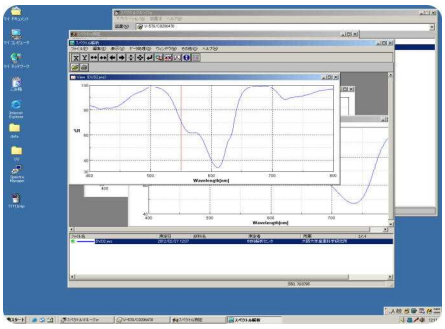
Infrared Spectrometer React IR





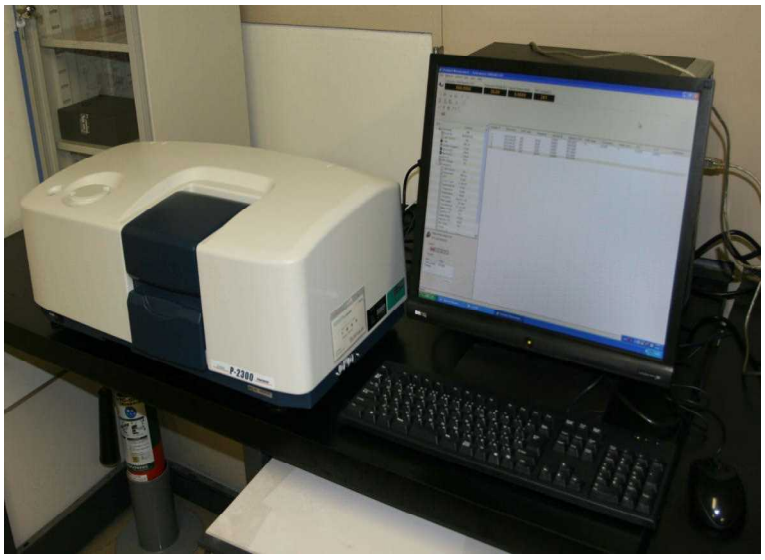
This spectrometer enables continuous measurement for the shortest time of every 5 seconds, which continuously monitor various changes in a solution by showing infrared spectra. The spectrometer is effective for analysis of reaction mechanisms due to identifiability of reaction intermediates existing only during chemical reactions and observability of the extinction rate of starting materials and the formation rate of products from changes of peak intensities.

Ultraviolet-visible Near Infrared Spectrophotometer UV・Vis・NIR



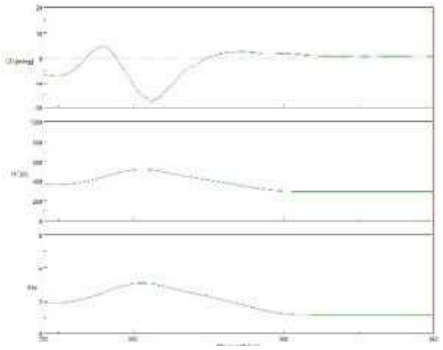
This spectrophotometer enables continuous measurements between ultraviolet and near infrared regions. The spectrophotometer has automatically switchable detectors by measurement wavelengths: a photomultiplier tube for the ultraviolet and visible regions, and a PbS detector for the near infrared region. Using an integrating sphere enables diffuse reflection measurement of solid surfaces and diffuse transmission measurement of suspension. Most of incident light to the sample, reflected and/or transmitted in all directions, is acquired by the integrating sphere, which enables accurate measurement.

Polarimeter P-2300



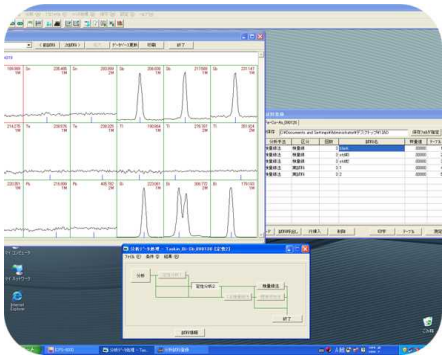
This polarimeter has both sodium and mercury lamps and a Glan-Taylor prism as a polarizer. The measurement wavelength is selectable from 589, 578, 546, 436 and 365 nm. The polarimeter has various types of cells, which enables to measure samples of at least 100 µl. Highly accurate measurement under temperature control by using an air-cooling Peltier cell is also performable.

Circular Dichroism spectrometerJ-1500



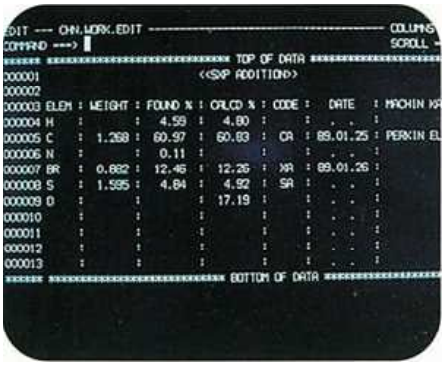
CD (Circular Dichroism) spectrometer is suitable not only in the ultraviolet and visible regions, but also wide range of measurement wavelength from vacuum ultraviolet to near infrared (163nm~1600nm) which cover the chiral polymer, supramolecule, proteins and nucleic acids chemistry. Moreover, the CD measurement at the solid state is available with powder CD measurement unit.

Inductively Coupled Plasma Spectrometer ICP



This top-class ICP emission spectrometer has 2 sequential scanning spectrometers, which exhibits both high resolution and high speed. Plasma energy from the spectrometer excites component elements in samples. The spectrometer measures emission rays of the excited elements transiting to the lower energy levels. The spectrometer enables a wide range of highly accurate analyses including ppb-level analysis of trace elements in a solution and high concentration analysis such as composition analysis. Rapid simultaneous quantitative analysis of multiple elements is also performable.

Organic Trace Element Analyzer CHN

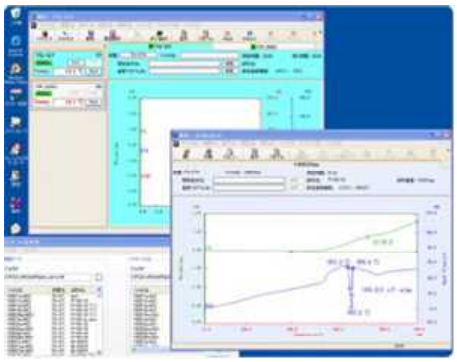


Elemental analysis is a classical and important quantitative analysis and purity test, which determines a weight percentage of elements composing pure samples including organic compounds by combustive and oxidative decomposing the pure samples. The analysis is mainly applied to confirmation of synthetic chemicals and determination of the structure of natural compounds. Stable and highly pure samples afford highly accurately analytical values. Measurable elements are carbon, hydrogen and nitrogen.

Element Analyzer CHN

Elemental analysis is a classical and important quantitative analysis and purity test, which determines a weight percentage of elements composing pure samples including organic compounds by combustive and oxidative decomposing the pure samples. The analysis is mainly applied to confirmation of synthetic chemicals and determination of the structure of natural compounds. Stable and highly pure samples afford highly accurately analytical values. Measurable elements are carbon, hydrogen and nitrogen. Ash content is also quantifiable.

Thermal Analyzer　TG-DTA,DSC8270

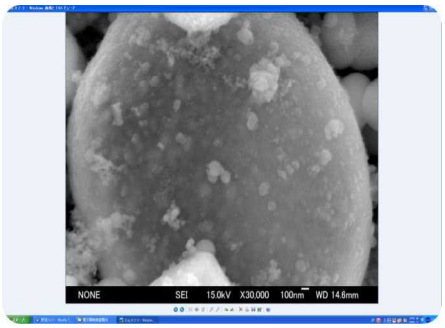


Thermal analysis is variously applicable to characterization of substances, which easily affords accurate analytical information from relatively small amount of samples, which is essential for research related to materials, polymers, petroleum products andbiosubstances. Combination of the thermal analysis with EPMA and PXD, installed in CAC, enables better evaluation of solid materials. This differential thermal balance TG8120/high temperature infrared heater TG-DTA of Thermo plus EVO II/TG-DTA series, developed by Rigaku, has a service temperature from room temperature to 1500°C and the maximum temperature elevation rate of 1000°C /min. The analyzer has a high temperature differential scanning calorimeter DSC8270 and enables simultaneous measurement of TG-DTA and DSC.

X-ray Microanalyzer EPMA

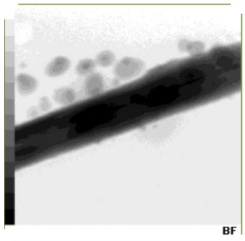
EPMA (Electron Probe Micro-Analyzer) finely narrows generated electron beams from an LaB_6 electron gun to tens nanometers and accelerates the beams to up to 40 kV to irradiate the surface of solid samples. Determination of elements composing the samples and quantitative analysis of the samples are performable based on the wavelength of characteristic X-rays generated from the samples. Mapping measurement indicating element distribution states and linear analysis are also performable. The EPMA has measurability of B ～ U, 8 analyzing crystals and 4 detectors. Measurability of cathode luminescence is characteristic of the EPMA. The EPMA exhibits remarkable effect on evaluation of metals, minerals, ceramics, semiconductor materials etc.

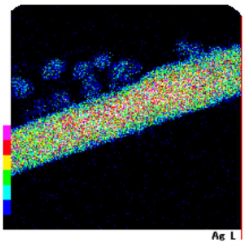
Scanning Electron Microscope FE-SEM+EDS

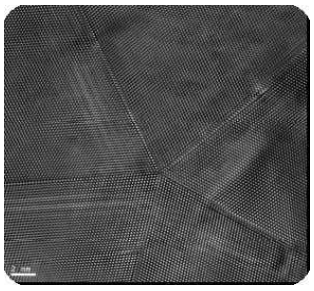


Scanning electron microscope (SEM) for analysis (JSM-6335F) has resolution of ~5nm (15 kV) and acceleration voltage of 1~30 kV. A characteristic X-ray detector in an element analyzer in the SEM is required no liquid nitrogen supply and cooled by a Peltier element. The SEM has detectability of Be~U and energy resolution of 138 eV or more. Appropriately using carbon coater or osmium coater according to purposes enables to acquire clear images. Attending a lecture on FE-SEM+EDS are reguired to use.

Transmission Electron Microscope JEM-ARM200F

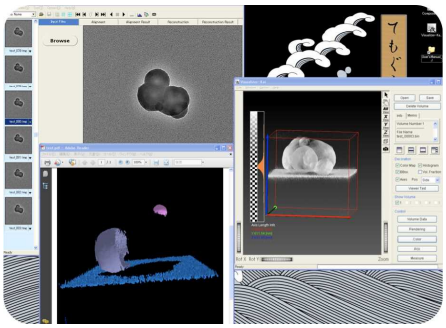






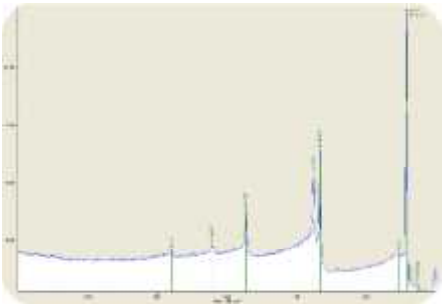
This microscope is a Schottky emission electron gun equipped with a ZrO/W emitter as a cathode, which has higher brightness and a smaller electron source than a thermionic electron gun and affords higher current stability and larger probe current than a field emission electron gun by heating at the high temperature of 1800 K. Negative spherical aberration coefficients obtained by an attached spherical aberration corrector (Cs corrector) counteract positive spherical aberration coefficients obtained by a condenser lens having a symmetrical axis of a magnetic field, which enables to acquire smaller and higher intensity probes and to analyze elements with higher resolution. Detecting electrons transmitted through film samples acquires STEM images affording scattering/absorption, diffraction and phase contrasts.

Transmission Electron Microscope 3 D-TEM



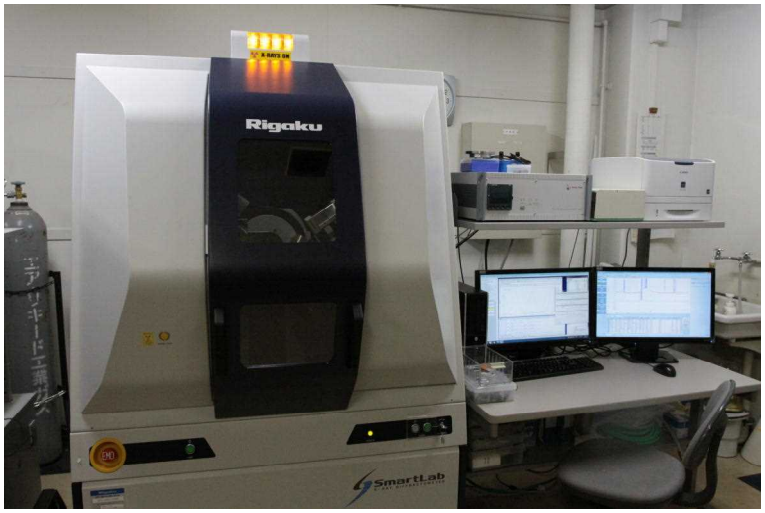
LaB_6 electron gun-equipped transmission electron microscope (200 kV) (JEM-2100) enables high resolution and high contrast observation, which is suitable for observation of biological samples. CCD camera enables to photography TEM images as digital data. High-tilt holder enables to set the tilt angle of samples to up to ±80°. TEM tomography system enables to automatically acquire continuously tilted images. 3D reconstruction of samples and visualization of 3D structures are performable by PC.

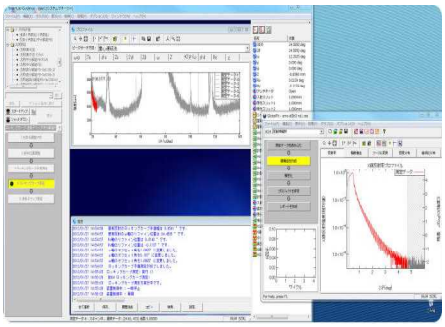
X-ray Photoelectron Spectroscopy XPS



X-ray photoelectron spectroscopy (XPS), one of the surface analysis instruments, is utilized for the analysis of wide materials such as metal, a semiconductor, organics and ceramics.This method supplies the chemical states of a wide range of elements.About 6nm depth from the surface and several cm^2 area of the sample can be analyzed.Ion etching enables a depth direction analysis.Ultraviolet photoelectric spectroscopy (UPS) is also applicable.

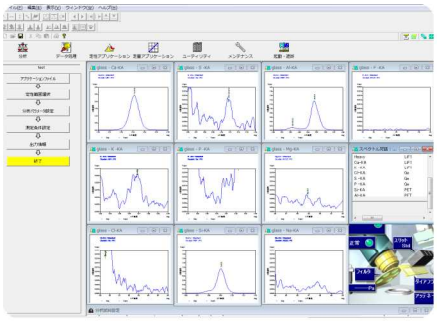
X-ray Diffractometer XRD





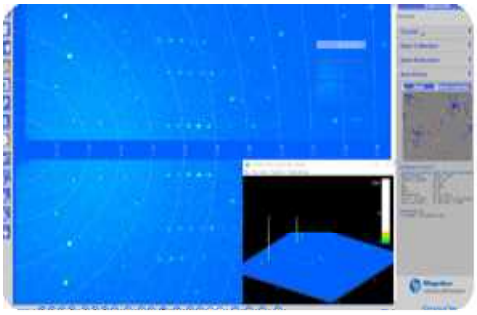
This multipurpose diffractometer measures scattered and diffracted X-rays generated from solid samples by irradiating strong X-rays (45kV, 200mA, Cu), which exhibits remarkable effect on film samples. The diffractometer is applicable to in-plane, film thickness, orientation, particle and void size distribution, and rocking curve measurements. Following guidance function allows users including beginners to easily obtain data. Choosing an incident X-ray source from Ge double crystals or Ge quadruple crystals enables high resolution measurement. The diffractometer has a scintillation detector, a one-dimensional detector enabling fast measurement within several minutes,

X-ray Fluorescence ZSX-100e



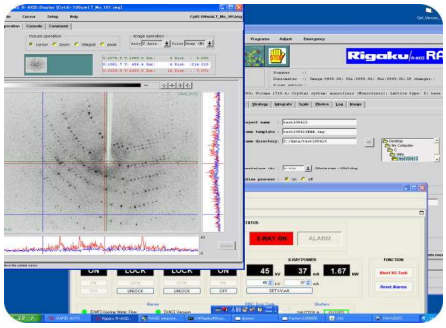
This wavelength dispersion X-ray diffractometer (WDX) was transferred to CAC, through a courtesy of prof. Tohru SEKINO, ISIR. A vacuum tube (Rh) of 4kW used as an X-ray source in the WDX diffracts fluorescent X-rays generated from samples to 5 analyzing crystals (LiF1, PET, Ge, RX-25 and RX-75). Two detectors (scintillation counter and gas flow proportional counter) in the WDX enable highly sensitive qualitative and quantitative analyses of various elements (from F to U except for C, N, and O.). The WDX corresponds to powder, bulk and liquid samples. Continuous measurement (turret-type measurement) enables simultaneous measurement of up to 12 samples. The WDX has SQX program performing semi-quantification by FP method without standard samples through qualitative analysis results, and EZ scanning mode allowing users including inexperienced users to perform SQX analysis without instruction manuals.

X-ray Diffractometer for Single Crystals XtaLAB



The single crystal X-ray diffractometer has two X-ray sources, Mo and Cu. Shutterless high-speed measurement is also possible by the new detector with zero noise and a wide dynamic range. Not only low-molecular compounds but also metal complexes, protein crystal are suitable as the analytical samples. Data processing software, CrysAlisPro is enabling efficient analysis with the automatic analysis.

X-ray Diffractometer for Single Crystals IP



This diffractometer using Cu as an X-ray source enables to determine the absolute structure of organic low molecules, which is also suitable for crystals having a large lattice constant. High brightness mirrors attached to the diffractometer enables to secure a 10 or more time higher bright X-ray source than an X-ray source of rotary anticathode X-ray generator (18 kW) and to collect data of fine crystal. The diffractometer has a curved IP detector unit having a resolution of more than 150° in terms of 2θ and RAPID-AUTO as software.

5.Subscription Journals

CAC subscribes to the following journals. Data collections are also available. The journals and data collections are available in 201 and 206 in CAC. If you want to read them, please feel free to ask CAC staffs.

Journals

1) ANALYTICAL CHEMISTRY 1929 ~ 1972, 1978 ~ 2006
2) Bunseki Kagaku 1952 ~
3) Shitsuryo Bunseki 1982 ~ 2006
4) Bunseki 1975 ~
5) Journal of The American Society for Mass Spectrometry 1996 ~ 2006
6) Advances in X-ray Chemical Analysis Japan 1974 ~

Data collections

1) ICDD (International Centre for Diffraction Data) ~ Set 56
2) Handbook of Proton-NMR Spectra and Data. Vol. 1-10 (1985), Academic Press.
3) Carbon-13 NMR Spectral Data, Fourth Edition, Microfiche Collection. Vol. 1-3 (1987), Equipment for Microfiche Reader, VCH (medium)
4) EPA/NIH Mass Spectral Data Base. Vol. 1 (1987) - 4 Suppl. 2 (1983), NSRDS
5) Molecular Structures and Dimensions. Vol. 1 (1970) - Vol. 15 (1984), Crystallographic Data Center, Cambridge

Videos for learning analysis [物質の科学・有機構造解析 (Material Science and Organic Structural Analysis), The Open University of Japan]

CAC Pamphlet, CAC Users' Guide

6.CAC Usage Rules

Please utilize the all instruments in CAC by following CAC usage rules.

- Opening Hours: 8:30 ~ 18:00 (except Saturdays, Sundays and national holidays)
- Utilization of CAC: Procedures under "CAC Web System" is required (p.22).
  (Access to "CAC Web System" in a webpage of CAC.)
- Overtime Utilization: ISIR card is required for utilization of CAC after 17:30 on weekdays, and all days on Saturdays, Sundays and national holidays (p.21).
- No street shoes allowed (the entire building): Use dedicated slippers in footwear boxes in the entrance.
- No smoking: The entire building
- Reprinting: Published articles describing research results have to contain acknowledgements and the reprinted articles have to be submitted to CAC. →The articles are exhibited at the entrance of CAC.

  (e.g.) We thank the members of the Comprehensive Analysis Center, ISIR, Osaka University, for spectral measurements, X-ray diffraction data, and microanalyses.

7.Overtime Utilization

ISIR card is required to utilize CAC during 18:00 to 8:30 on weekdays, and all days on Saturdays, Sundays and national holidays.

1. ISIR-issued ISIR card (Figure 1) is required to enter and exit CAC and laboratories during overtime utilization. Be sure to have the ISIR card.
2. Unlock/lock a door by holding the ISIR card (Figure 1) over an electronic lock controller (Figure 2).
3. The electronic lock controller is contactless, which enables to use the ISIR card even left in a wallet etc.
4. An electronic lock of a laboratory is automatically locked after entering the laboratory. When leaving the laboratory, unlock the electronic lock from the inside of the laboratory.
5. Left an opened door over 30 seconds sounds an alarm. The alarm is stopped and the door is locked when the closed door is confirmed.
6. All electronic locks are unlocked when unexpected power failure happens.
7. In emergency, uncover an emergency cover for the electronic lock of the inside of the entrance or open an emergency exit in every floor to exit.

Figure 1

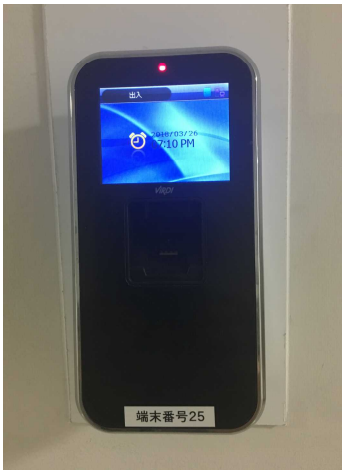


Figure 2

8.CAC Web System

All instruments are required to access to "CAC Web System". Access to the system from the dedicated PC near an instrument or a PC set in each laboratory. The procedure is as follows;

1)Click "CAC Web System" in a webpage (top page) of CAC.
2)Choose the desired instrument shown in a screen (Figure 3).

The usage status is described in gray letters under the device name. (Available now = available, Busy = used,

Request Only = request analysis only, Maintenance = under maintenance)

3)Enter User and Password in center of a screen of CAC Web System (Figure 4) to login.

(Click "Create an account" if you use the system for the first time.)

4)Choose your request from Use, Wait, Reserve or Request.

5)When finishing the input to the system, click Logout in the left side of the screen.

Note: The system is automatically disconnected by left no operation of the system over 30 minutes. Re-login to re-access to the system.

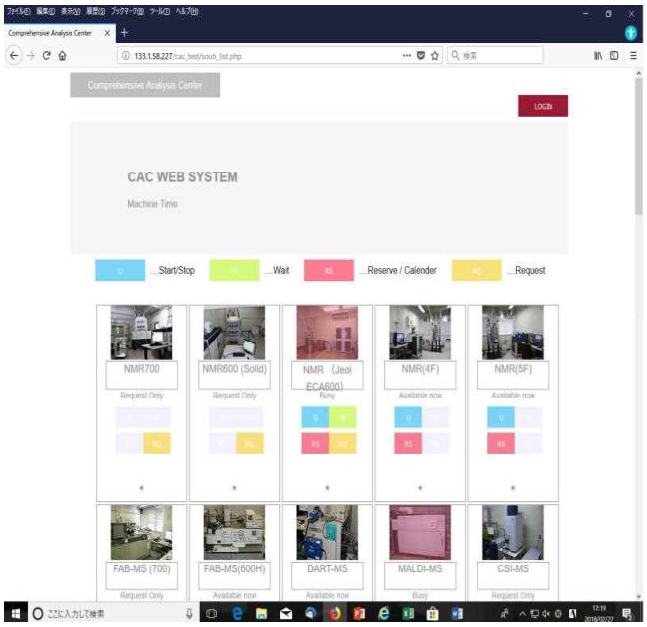


Figure 3

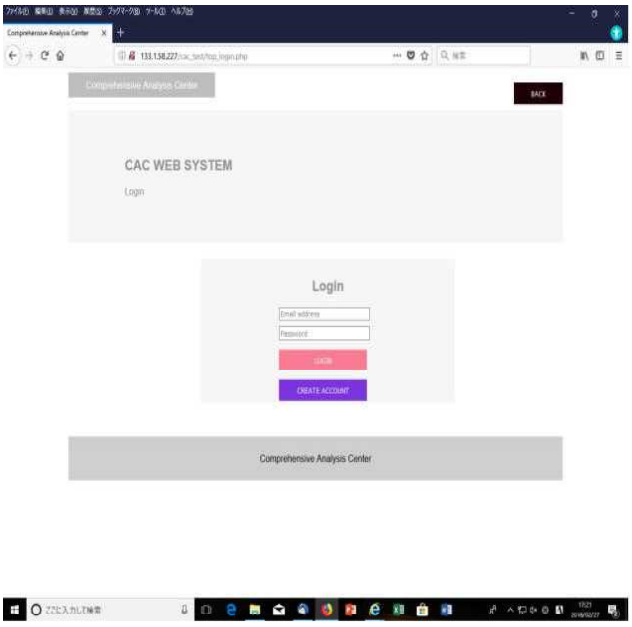


Figure 4

9.Reservation Procedures

・Self Measurement

1)After the login, click “U” button of the desired instrument. (P.23, Figure 4).

2)Choose the utilization time. Click "Start" button when starting measurement (Figure 5).

3)Click "Stop" button when finishing the measurement (Figure 6).Choose Method and Solvent (In case of NMR Figure 7) (number of samples for mass spectrometers, Figure 8) in the following screen. Enter a comment if needed.

*If next user is waiting, please contact the next user by telephone.

If the instrument is in use

1)Click "W" button .

2)After the login choose a utilization time in the following screen.

3)Click "Waiting" button.

*Press the "start" button when starting measurement.

If you perform measurement on a specific date and time or long-time measurement at night

1)Click "RS" button.

2)Choose a utilization time in the following screen.

3)Click "RESERVE" button.

*Performing "RESERVE" is available for a reservation after 3 hours or later from the present time.

*Perform "Waiting" for a reservation within 3 hours from the present time.

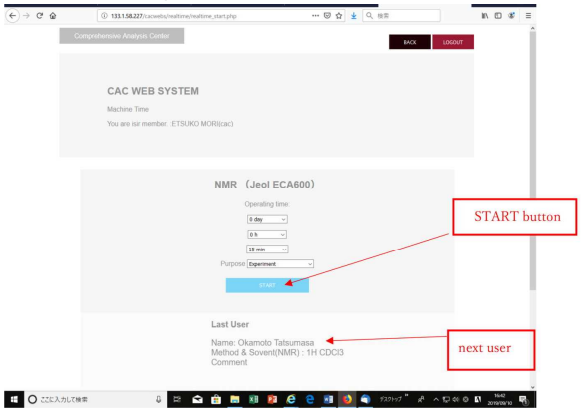


Figure 5

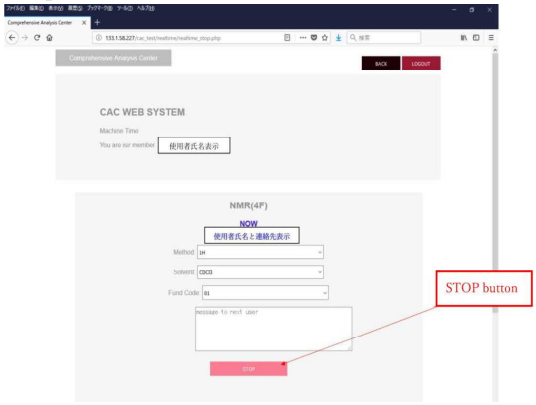


Figure 6

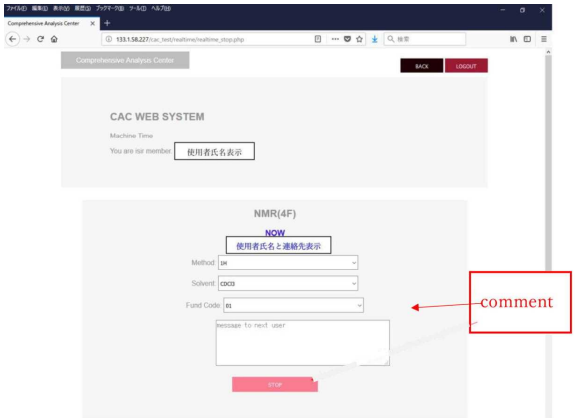


Figure 7

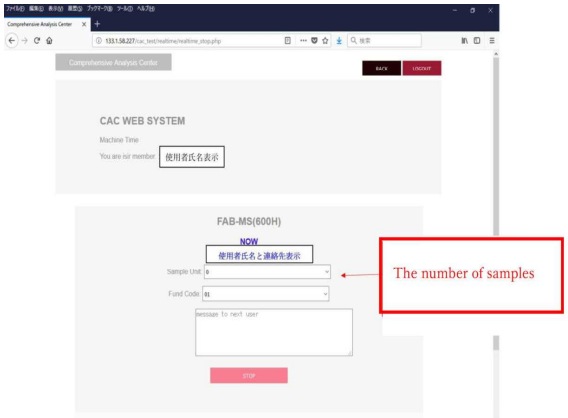


Figure 8

・Request Measurement

Request measurement is available for special measurement methods and nuclides and/or users with no utilization experience.

1)After the login, click "RQ" of Request of the device used. (P.23, Figure 4).

2)Enter information about a sample and click ” (Request)” (Figure 9).

3)A record with the information about the sample is created (Figure 10). Print out and submit the 1record with a sample to a staff of the measurement.

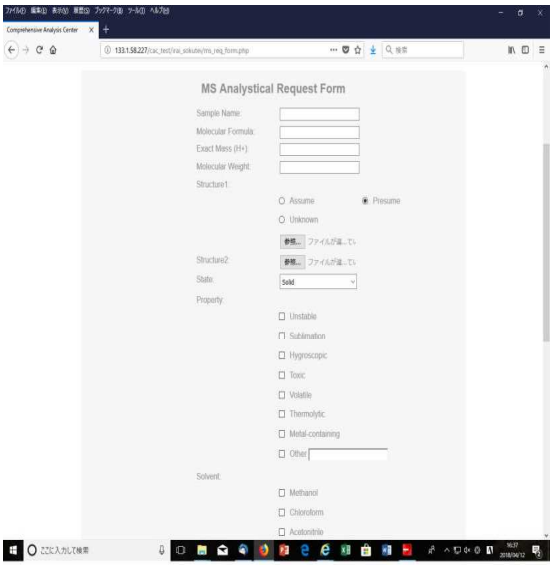
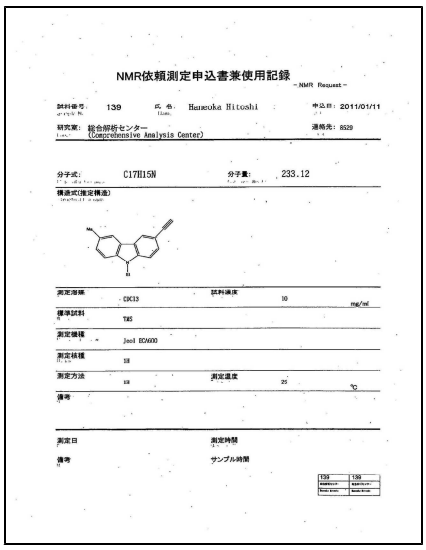
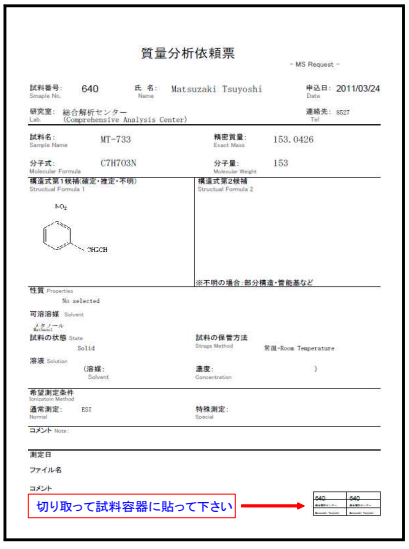


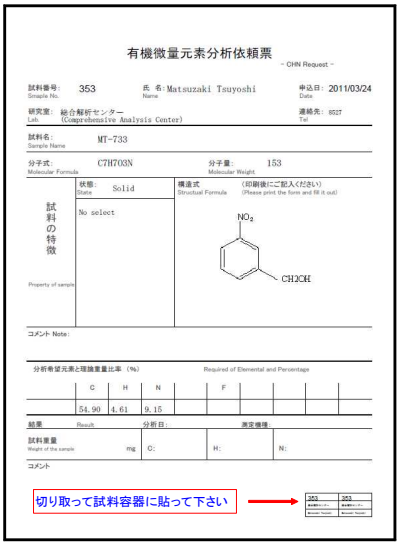
Figure 9



NMR request



MS request



Elemental Anal request

Figure 10

・Other request Measurement

Utilization of transmission electron microscope is reservable from 10 am on every Thursdays in room 105 in the 2nd Building.

*Utilizing JEM-ARM200F is not reservable by accessing to CAC Web System.

(a) Request Measurement

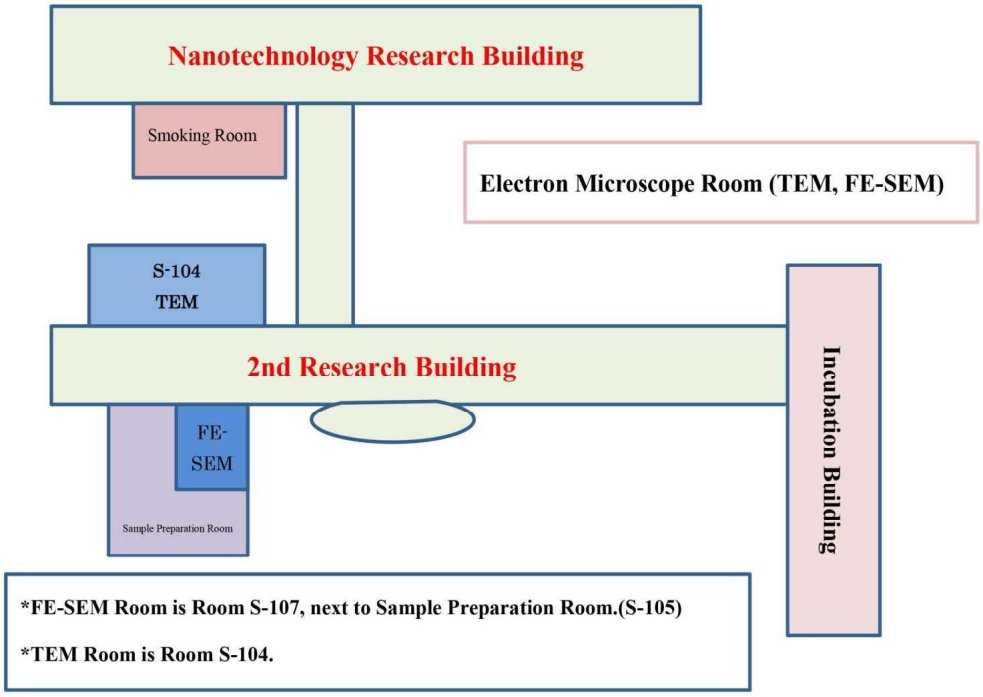
・Please feel free to discuss measurement and preparation method for samples. Please come in Room 105 (Sample Preparation Room) in the 2nd Building.

(b) Self Measurement

・Fulfill the both following requirements; utilization experience of any electron microscopes and permission by a CAC staff .

(c) Sample preparation

・A lecture on the sample preparation is held if needed.



10.Intramural and Extramural Cooperation

A part of instruments in CAC is served for intramural and extramural cooperation by cooperating with Center for Scientific Instrument Renovation. Center for Scientific Instrument Renovation, with the developmental reorganization of Manufacturing Center, was established in the 1st of April, 2007. Fundamental instruments for research and education, with conventional supports of "manufacturing", research and education by Manufacturing Center, are repaired, restored and reborn to promote "reuse promotion" with intramural cooperation between staffs and students.

Center for Scientific Instrument Renovation http://www.reno.osaka-u.ac.jp/index.htm

Collaborative Research Facility Network, former Effective Utilization Network for Chemistry Research Facility, centering on Institute for Molecular Science, National Institutes of Natural Sciences in 2007, promotes extramural cooperation. The network in the western Kinki region is positioned in Osaka University.
Prof. Sasai, the previous director of former MAC, continues to be the chairperson of the network of the western Kinki region. See the following webpage for details.

Collaborative Research Facility Network http://chem-eqnet.ims.ac.jp/index.html

11.Pleas from CAC

Contributions to research in CAC have to be persuasively exhibited due to transforming Osaka University into a national university corporation.

When articles describing research results acquired by using instruments in CAC are submitted, the articles have to contain acknowledgements (See p.21 of CAC Users' Guide). Additionally, when the articles are printed and published, submit one reprint of each of the articles to CAC.

CAC annually publishes CAC Information with research results acquired by using the instruments in CAC. The reprinted articles are exhibited at the entrance of the 1st floor of CAC. The articles have been favorably received by not only CAC users but also CAC visitors including high school students.

CAC staffs wish furthermore developments of research of all users' by using the instruments in CAC

12.Floor room