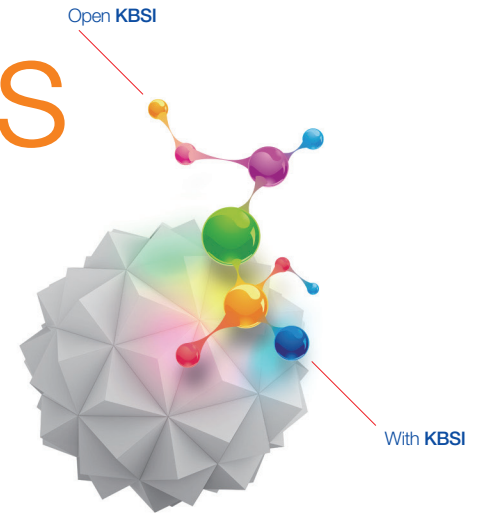


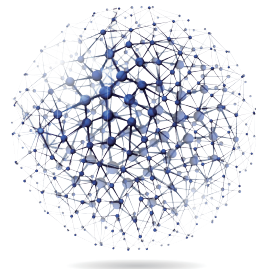


www.kbsi.re.kr

Open World-class Research Platform



We are determined
to be the world's top player
in scientific research infrastructure



KBSI KOREA BASIC SCIENCE INSTITUTE

169-148 Gwahak-ro, Yuseong-gu, Daejeon, Korea 305-806
TEL. +82-42-865-3500 FAX. +82-42-865-3404
www.kbsi.re.kr



Analysis support application E-mail: use@kbsi.re.kr
Scan the QR code on the left with your smartphone and
it will take you to the application page (<http://use.kbsi.re.kr>).

KBSI KOREA BASIC SCIENCE INSTITUTE

Knowledge

Basic

Science

Inquiry

KBSI

Knowledge

KOREA BASIC+ SCIENCE X INSTITUTE

Present Status

- 06 President's Greetings
- 08 KBSI History
- 09 KBSI Vision

Main Research

- 12 Leading analytical service institute
- 16 Development of equipment and analytical methods
- 22 Specialized research and convergence research
- 34 World-class research equipment infrastructure
- 38 Satisfaction of national needs by utilizing basic science infrastructure

Appendix

- 44 The list of joint utilization equipment
- 47 The counseling center for analysis service with high-tech equipment
- 48 Contact Information

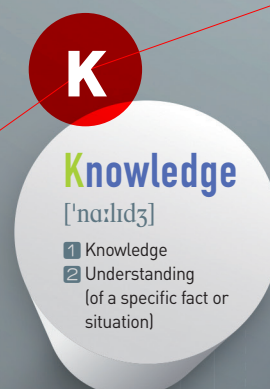
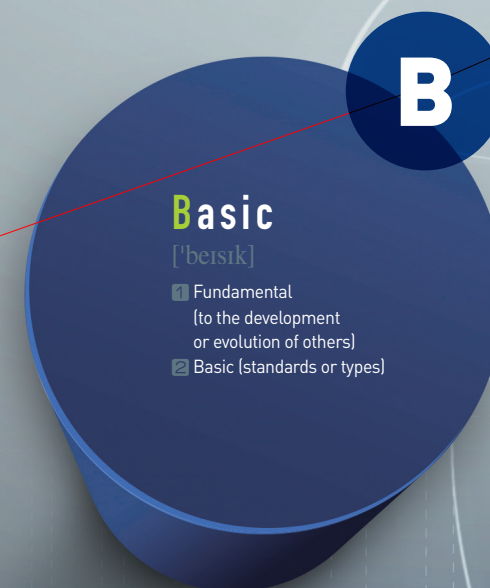
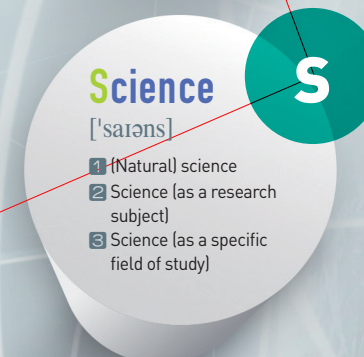
Open KBSI, With KBSI

KBSI is an open research institute.

It fulfills the role as “a platform for key basic science research” open to all individual researchers, institutions and corporations in the private sector.

KBSI moves ahead with public happiness.

Science and technology are the starting point to keep health and happiness of people.
KBSI is committed to “science for happiness”.



Success

Solution

Business Strategy

Business Strategy
Innovation
Branding
Solution
Marketing
Analysis
Ideas
Business
Development

Open KBSI, With KBSI

We are determined to be the world's top player in scientific research infrastructure for basic science research.

Korea Basic Science Institute (KBSI) is an open scientific research institute committed to support research activities and conduct joint research projects with various individuals and organizations.

KBSI has built and been operating large cutting-edge research equipment of world's top class, and conducted joint research with, and also provided support for, the research activities of researchers in universities, research institutes and private corporations. With these, KBSI fulfills the role as a platform for basic key research and provides a multi-functional platform in which large cutting-edge equipment is integrated with research support programs and joint projects that are essential elements for basic scientific research.

KBSI has been devoted to science and technology that secures people's health and happiness through the development of analytical techniques and research activities that help solve various problems in our society. Our institute is also playing a central role in the efforts to keep people's health and happiness through the construction of up-to-the-minute research equipment and facilities, development of new analytical methods, and studies that help exploit the methods for real life. In addition, KBSI promotes small to medium businesses through R&D of analytical equipment, thus contributing to the creation of more jobs and increase of exports which will lead to economic progress and, finally, the success of Creative Economy in Korea.

We at the KBSI try our utmost to achieve the goal to turn our institute into one of the world's top basic research institutes open to all those who share our vision. We will continue to closely cooperate with our fellow researchers across the world to develop KBSI into one of world's most productive basic science research support providers armed with mega-size cutting-edge research equipment and facilities, creating new technologies that can lead the international community to a brighter and happier future. Thank you.

||||||| President of Korea Basic Science Institute

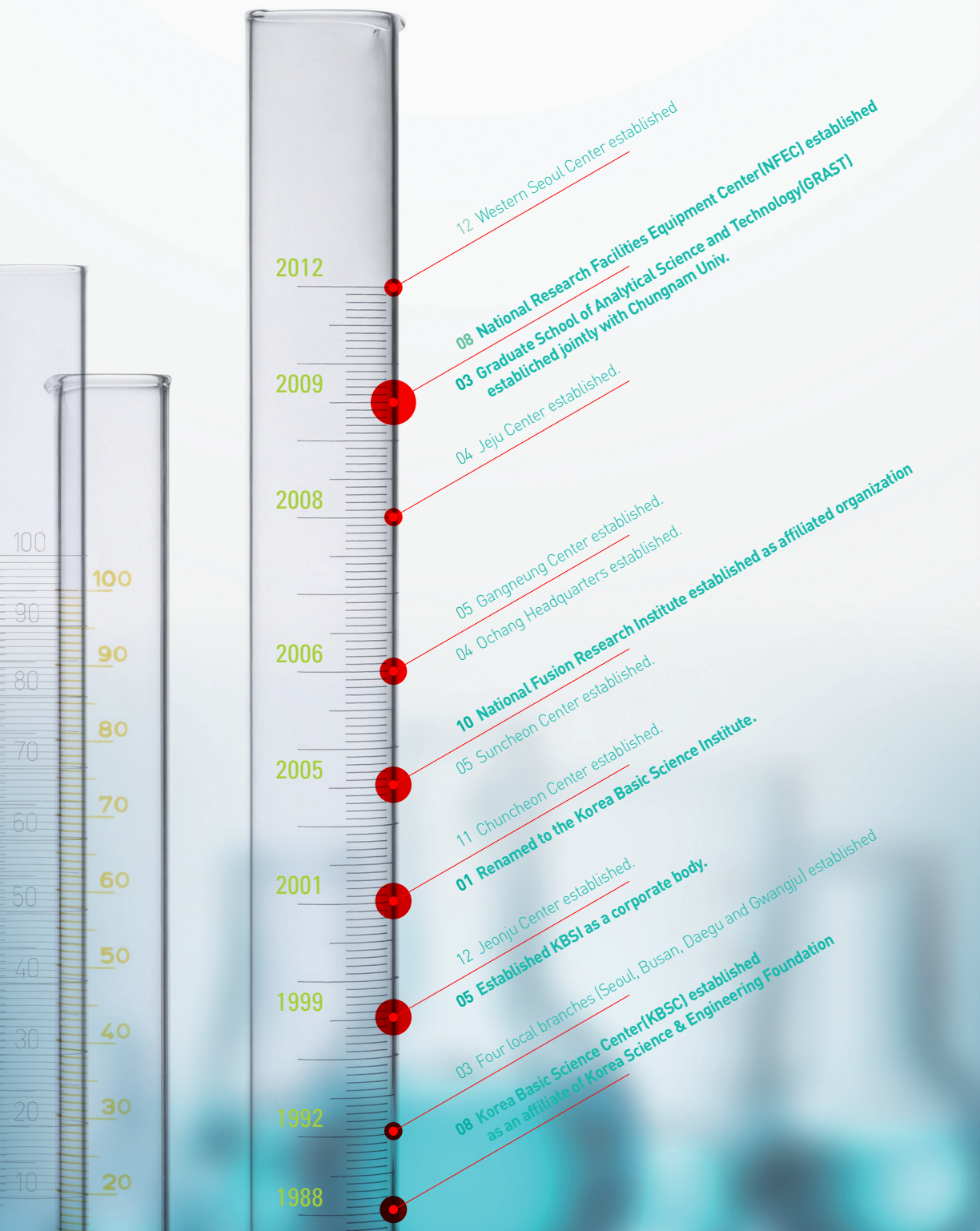
Wanghwa Choy



The history of the KBSI is the history of basic science in Korea.

KBSI History

Korea Basic Science Institute



KBSI Vision

Korea Basic Science Institute

Objective

Research support and collaboration to advance basic science, the foundation for national science and technology development

Vision

Open world-class research platform

Missions

- Representative institute for construction, operation and utilization of large scale research equipment
- World-class institute for basic science research support
- Central institute to manage research equipment of national research facilities
- Leading institute for analytical science research



Knowledge
Basic
Science
Inquiry

KBSI

한국기초과학지원연구원
KOREA BASIC SCIENCE INSTITUTE

Basic

Leading analytical service institute

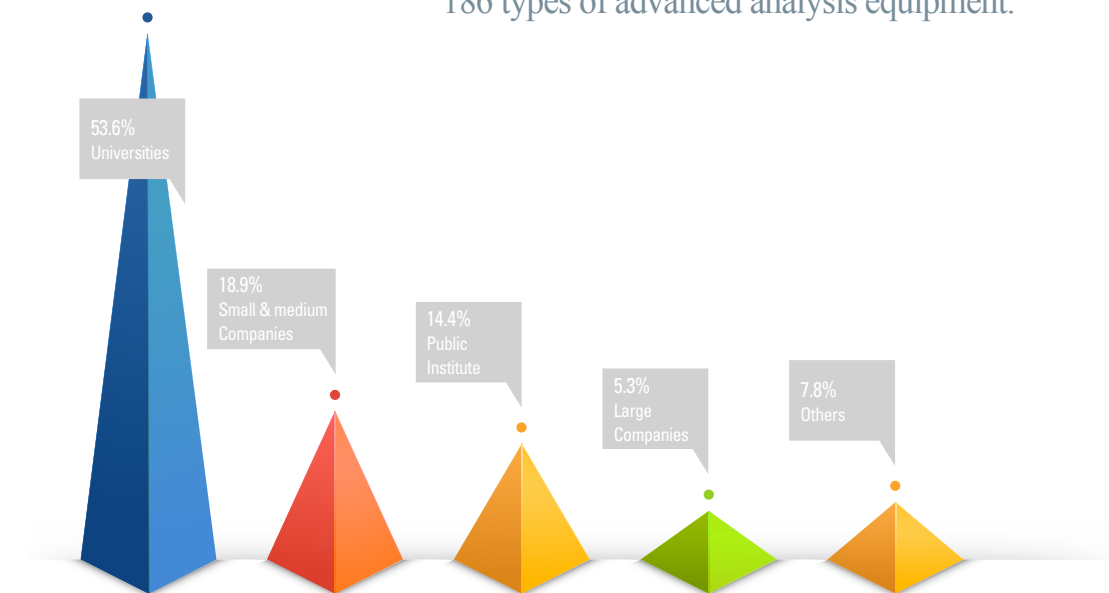


Measuring natural radioactivity at low level

[Research office of Dr. Jeong Hee Han, Division of Earth and Environmental Science Research, Ochang Headquarters]

Status of Analysis & Application Procedures

Korea
Basic Science
Institute



Records in 2013

Users
Total Users

5,397

Record of analytical services
Number of analyzed samples

129,493

Records for user publications
Total number of papers

704



use.kbsi.re.kr

- Application for analytical service
- 1. Contacting the call center for analytical service
- 2. Consulting analysis with staffs for equipment

- Application for use of equipment
and analytical service over homepage (use.kbsi.re.kr)

- Review of status of applications for analysis,
and checking the results

- Payment of analysis fee,
and forwarding test result report

01 STEP

02 STEP

03 STEP

04 STEP

KBSI supports advanced research activities differentiated for region-unique industries at 12 bases throughout the country.



KBSI makes use of analytical science and technologies for safeguarding health and well-being of people.

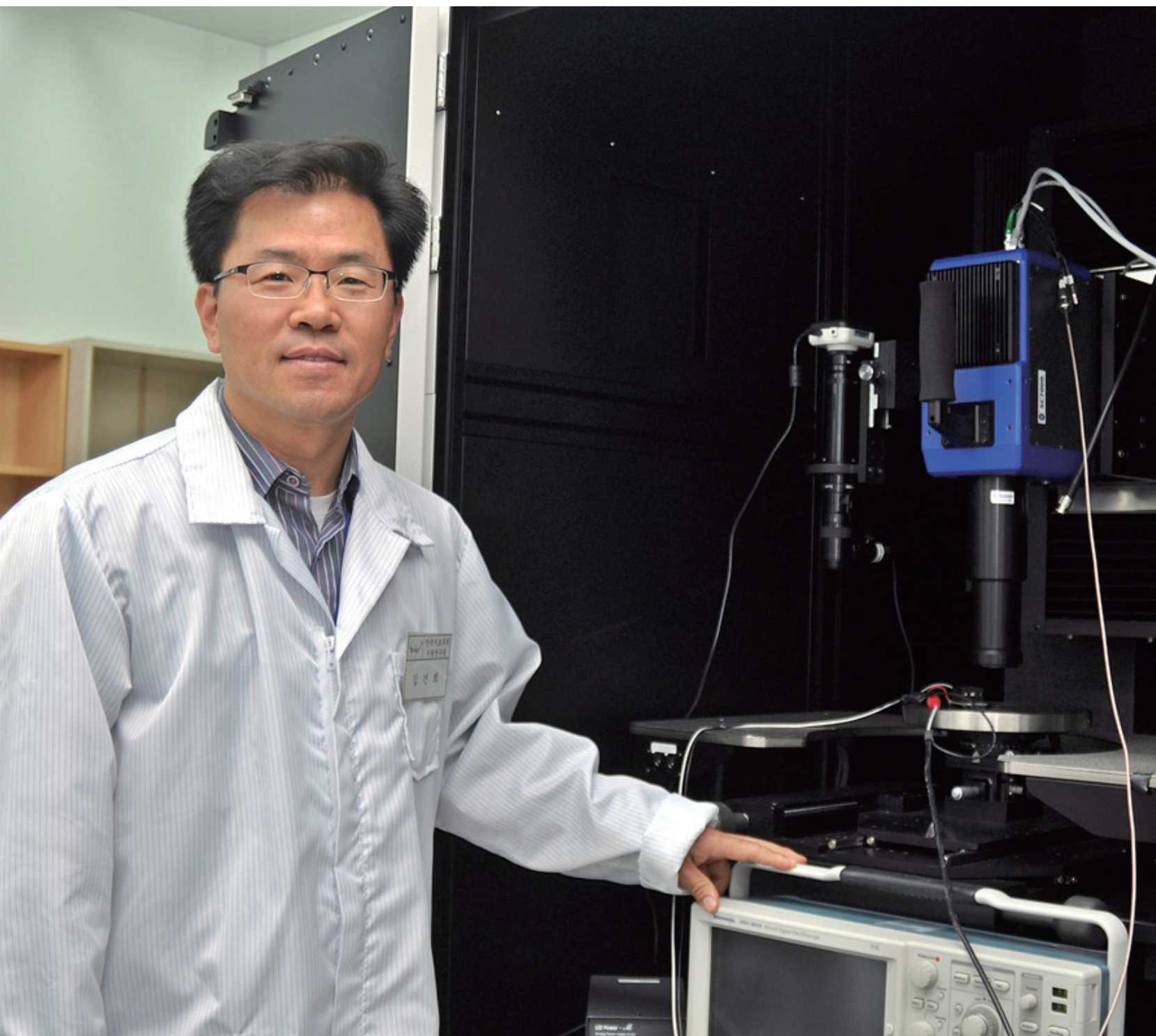
Background radioactivity analysis technologies of KBSI are capable of detecting radioactivity of extremely small volume that may be contained in fishery products as well as other essentials of life.

KBSI has succeeded in the development of analytical techniques that can trace the discriminating origins of food products by making use of elements and isotope contained in the products including beef, white cabbage, kimchi, and materials for herbal medicine.

KBSI safeguards health and well-being of people by performing research for the early detection of norovirus, and through various research projects that include brain and Alzheimer disease, diagnostic bio-chips, aging animals and advanced forensic science, which utilize the analytical techniques applied to metabolomics, proteomics and protein structure analysis.



Development of equipment and analytical methods



Dr. Geon-hee Kim succeeded in developing High-Precision Heat-imaging Microscope system
[Center for Analytical Instrumentation Development at Daedeok Headquarters]

Development of analysis and element equipment

Korea
Basic Science
Institute

Development of ultra-precision thermal image microscope system

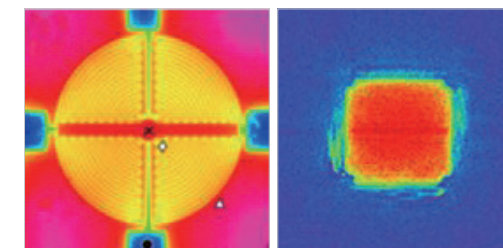
+ Daedeok Headquarters,
Center for Analytical Instrumentation Development

Overview

Forming real-time thermal images for developing ultra-precision thermal image microscope system capable of non-contact and non-destructive analysis of thermal properties of specimens

Major research

Development of ultra-precision thermal microscope system capable of non-contact and non-destructive analysis of thermal properties of specimens forming real time thermal images



Thermal image measured by microscope

Development of heavy ion accelerator employing an 28 GHz superconducting ECR ion source

+ Busan Center

Overview

Development and installation of superconducting ECR ion source for heavy ion accelerator and user facility

Major research

Complete development of ECR ion source component: 28 GHz-high power gyrotron and waveguide system, plasma and beam extraction chamber at high vacuum and voltage level, high field superconducting magnet in the LHe recondensed cryostat, low energy beam transport (LEBT) system.

Engineering design of heavy ion accelerator: radio frequency quadrupole (RFQ) accelerator.



28 GHz superconducting ECR ion source and LEBT system

Development of femtosecond multi-dimensional spectrometer

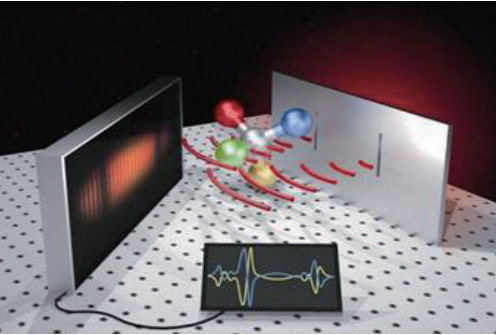
+ Seoul Center

Overview

A variety of femtosecond laser based multi-dimensional spectrometers have been developed to carry out real-time reaction dynamics studies of biomolecules and chiral species such as proteins, nucleic acids, and amino acids.

Major research

Real-time structural dynamics of amino acid derivative was studied by using two-dimensional infrared spectroscopy, and interferometric optical activity measurement method was developed to analyze stereo-specific structure of chiral molecule only with a single optical laser pulse.



Developing ultra-sensitive optical activated spectrometry by making use of laser wave interference techniques

Development of portable mass spectrometer

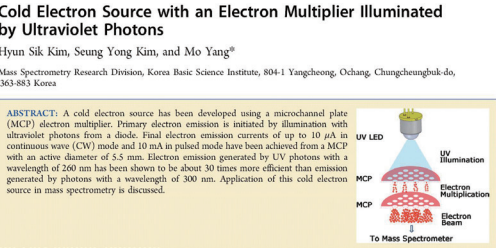
+ Ochang Headquarters,
Division of Mass Spectrometry Research

Overview

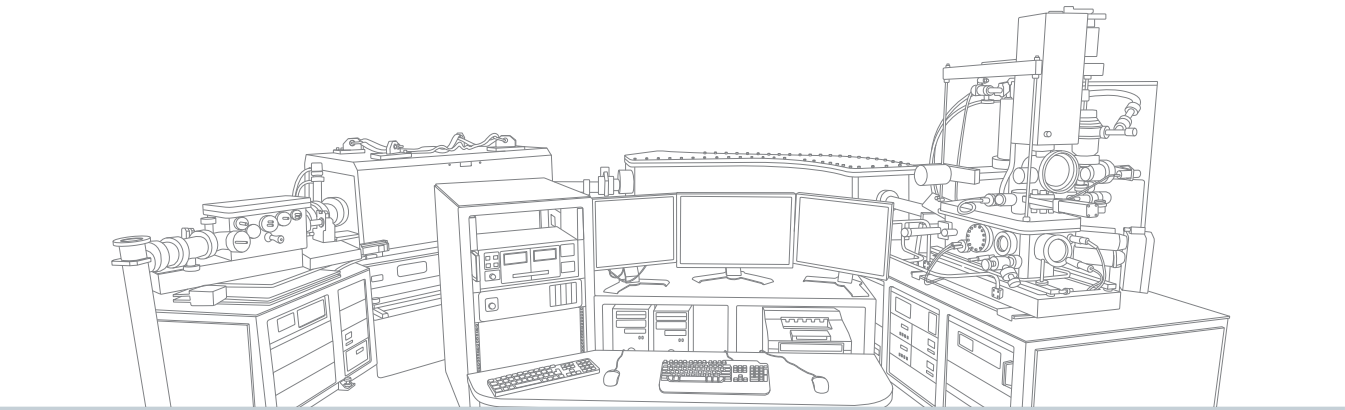
Development of portable mass spectrometer for real-time detection of extremely low concentration compounds in small volume at site

Major research

Development of mass spectrometer, ultra-compact vacuuming system, and low-power and ultra-compact cold electron ionization source with advantages over conventional hot electron ionization source for the purpose of fabrication of portable mass spectrometer, and posting the results on the journal of Analytical Chemistry.



Posting the results of development of ionization equipment for low-power mass spectrometer using cold electrons by utilizing electron multiplier and ultraviolet ray photon device



Development of conduction-cooling type 15 T high magnetic field material research system

+ Daedook Headquarters,
Division of Materials Science Research

Overview

Development of cryogen-free superconducting magnet technology, measurement of physical properties of semiconductor and magnetic substances, characterization of superconducting wire and magnet, and research of materials synthesis, control of chemical and physical reaction, and crystal growth under high magnetic field and/or low temperature.

Major research

Evaluation of conduction cooled 15 T superconducting magnet and performance test of high magnetic field material research system using in-house developed liquid helium cryostat under high magnetic field.



15 T superconducting magnetic and measurement system

Hybrid guide for FT-ICR MS (Fourier transform ion cyclotron resonance mass spectrometer)

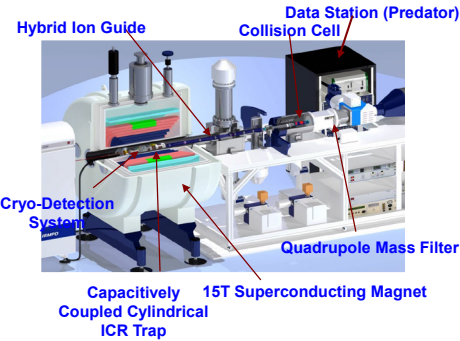
+ Ochang Headquarters,
Division of Mass Spectrometry Research

Overview

Invention of new ion guide capable of improving ion transmission efficiency at FT-ICR MS under high magnetic field

Major research

Developing FT-ICR MS of high magnetic field with sensitivity improved by ten times using a hybrid ion guide, and transferring the technology to Bruker Daltonics



Schematic diagram of hybrid ion guide

Development of Analysis Technology

Method for detection of interaction between bio-macromolecular substances

Research

Development of methods for direct monitoring interaction and inhibition between protein substances in living cells

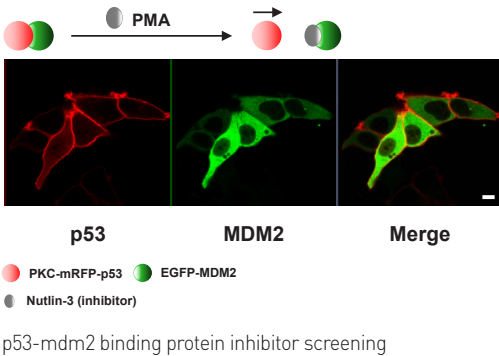
Direction of drive

Planning to establish fluorescein labeled human gene library for signal pathway, drug target, and drug screening in live cells, and introduce HSC system for supporting pharmaceutical companies and academy for this technology.

Related equipment

Confocal laser scanning micrometer

+ Daedook Headquarters,
Division of Life Sciences Research



p53-mdm2 binding protein inhibitor screening

Bio-imaging technology for early diagnosis

Research

Development of contrast agents for fusion imaging applicable to in vivo small animal imaging instruments (MRI, PET and etc) and new technology for evaluating of early diagnosis and therapeutic effects with these contrast agents

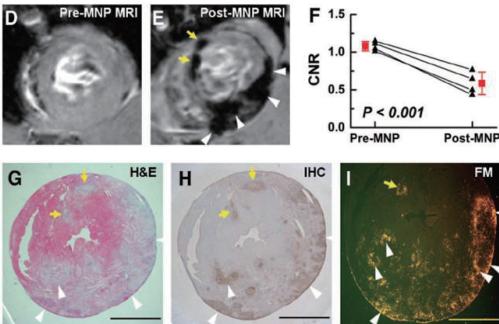
Direction of drive

Development of fusion imaging contrast agents capable to trace the immune cells having specific types and their application to tracking imaging of cellular infiltration behavior

Related equipment

4.7 T magnetic resonance imaging instrument

+ Ochang Headquarters,
Division of Magnetic Resonance Research



Comparative analysis between MRI image of infiltration behavior of macrophage, and results of issue examination

Development of new concept nano materials utilization technology

Research

A bottom-up self-assembly method created ionic liquid-Co(OH)₂ hybrid material which showed rapid and reversible redox-based supercapacitive performance. DFT calculations were comprehensively investigated to elucidate the critical role of ionic liquids on the redox reaction.

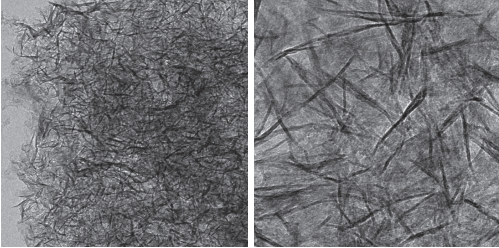
Direction of drive

The synthesis of ionic liquid-based hybrids will generally apply to other transition metal oxides or hydroxides for the development of energy storage devices. Also, using DFT calcuation will study the electrochemical reaction on interface of a transition metal oxide or hydroxide.

Related equipment

Transmission electron microscope

+ Daedook Headquarters,
Division of Materials Science Research



Transmission eletron microscope images of Co(OH)₂

Service of supplying aging animals for aging-related research

+ Gwangju Center

Research

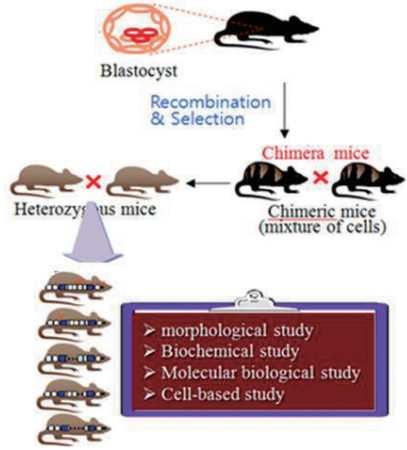
Research support and collaboration to study aging fields, which is the degenerative disease(e.g. nervous disease, cardiovascular disease, and muscloskeletal disease) by establishing and managing the foundation of a domestic unique of Animal Facility of Aging Science(AFAS) and establishing the research network of pathological, clinical, molecular bio-imaging area for maintain animal strain or disease animal model from laboratory animal

Direction of drive

Growing an one-stop total aging animal research institute for research support and joint research of special aging animals

Related equipment

Microscope controller, small animal bio-image equipment and ultra-compact CT



Research of individual level through aging experimental animals grown under aseptic environment

Discrimination of the geographical origin of agricultural and livestock products

Research

Combined analytical methods of strontium isotope ratio, multiple elements, metabolomic analysis and statistical analysis were performed to distinguish the geographic origin of Chinese cabbage produced in Korea and China. These techniques also provided a clear distinction between Korean and Chinese Kimchi

Direction of drive

An integrated classification system for discriminating the geographical origin of various foods will be developed

Related equipment

ICP-MS, ICP-AES, MC-ICP-MS, 600 MHz LC-MS-NMR

Scientific analysis of cultural heritage

+ Ochang Headquarters, Division of Earth and Environmental Science Research

Research

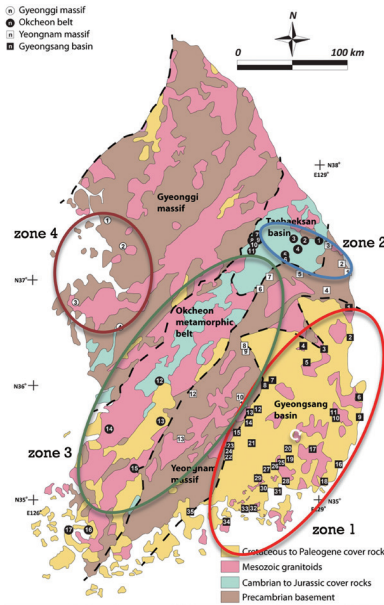
Development of analytical techniques for revealing the origin of excavated ancient bronze artifacts in the Korea peninsula

Direction of drive

The map of lead isotope distributions in the Korea peninsula was constructed for revealing the origin of ancient bronze artifacts.

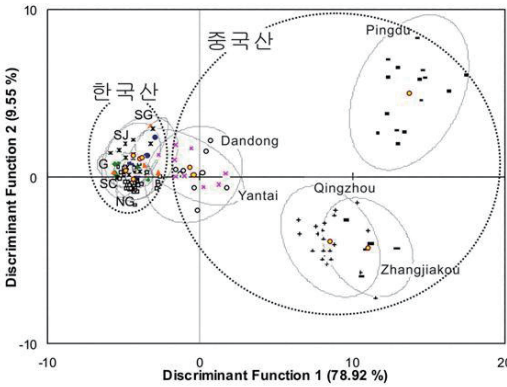
Related equipment

Thermal ionization mass spectrometer



Distribution diagram of lead isotope throughout South Korea

+ Ochang Headquarters,
Division of Earth and Environmental Science Research
Seoul Center



Determining the geographical origin of Chinese cabbages produced in Korea and China

Specialized research and convergence research



Knowledge
Basic
Science
Inquiry

KBSI

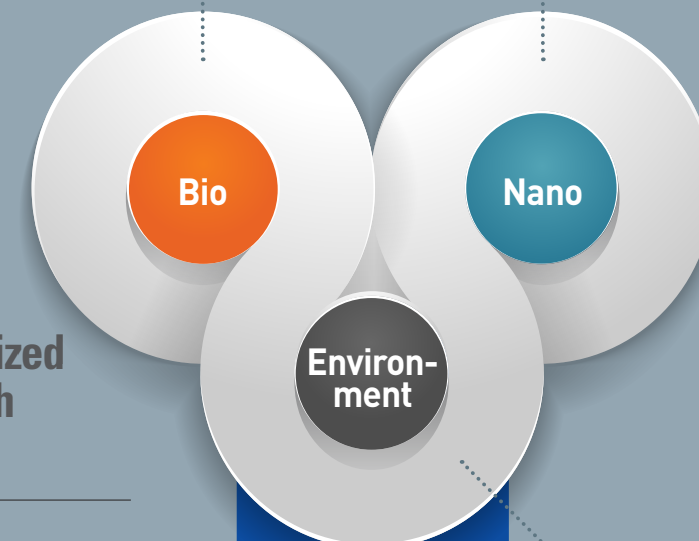
Science

Disease research using MRI imaging

[Dr. Jee Hyun Cho, and researcher Ravi at Division of Magnetic Resonance Research, Ochang Headquarters]

- Proteomics
- Bio-imaging
- Organic mass spectrometry
- Metabolomics
- Protein structure analysis

- Atomic structure imaging
- High magnetic field physical property of materials
- Nano-materials for energy
- Components and materials



Specialized
research

Convergence
research

KBSI

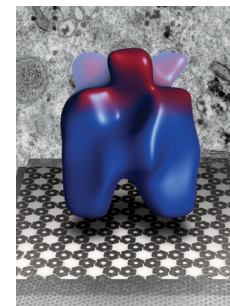
Total number of publications: 1,216
Number of SCI publications: 1,081
(Domestic and overseas
collaborations in 2013)

- Isotope analysis
- Inorganic mass spectrometry
- Age determination
- Environmental analysis

Three-dimensional protein structure analysis with transmission electron microscopy
(Dr. Jae-Kyung Hyun, Division of Electron Microscopic Research, Daedeok Headquarters)

Bio Science

Korea
Basic Science
Institute



Research for identifying structure of bio-substances and in vivo functions and mechanisms by making use of advanced analysis equipments and convergence technologies in wide scope from convergence biomechanics to marine biomechanics for the purpose of researching bio-substances, the fundamentals of living phenomena.

Proteomics | 01

Development of proteome analysis by making use of high-resolution mass analyzer, and research of analysis of fast proteome behavior and equation of protein for leading research of functional proteome in Korea.

Bio-imaging | 02

Most advanced research field to help identifying the cause of diseases and research for treatment by rendering various bio-phenomena in images including metabolism, protein synthesis, drug transfer and gene information on cells, organs and individuals.

Metabolomics | 03

Research for identifying biomarker of diseases and treatment by profiling motabolome changing dependent upon genetic and environmental factors in metaboloics fields.

Organic substance mass analysis | 04

Building infrastructure for advanced mass analysis together with experts of mass analysis for supporting research of developing new drugs, diagnosis and treatment methods, and environmental substance analysis with mass profiles of protein, metabolic substance, nano-compound substance and crude oil.

Protein structure analysis | 05

Utilizing EM and NMR equipment for studying three-dimentional structure, molecular interactions and dynamics of bio-materials and research for the development of structure-based treatments for deseases.

Enantioselective synthesis of alpha-alkyl-beta-keto ester

+ Dr. Geum-Sook Hwang
(Seoul Center)

Summary

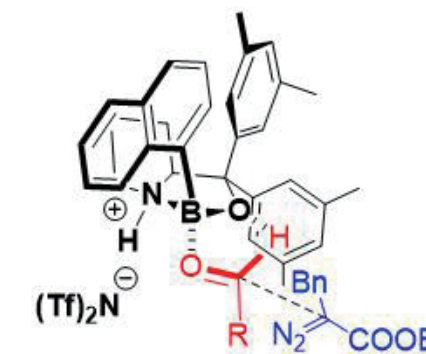
Development of synthetic methods for obtaining various alpha-al-kyl-beta-keto esters by using non-metal Lewis acid catalyst, and application to a concise two-step synthesis of sitophilate.

Posted paper

Enantioselective synthesis of α - alkyl - β - ketoesters: Asymmetric roskamp reaction catalyzed by an oxazaborolidinium ion *Angewandte Chemie-International Edition* 2012, 51(33), 8322-8325 (IF:13.455)

Related equipment

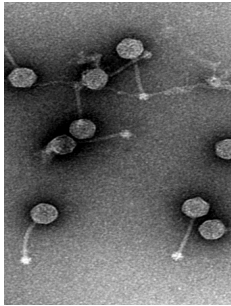
Integrated system of liquid chromatography-mass spectrometry-nuclear magnetic resonance spectroscopy(LC-MS-NMR)



Structure and potential model of catalyst

Nano Science

Korea Basic Science Institute



Research in various fields that include energy storage device, memory device and permanent cell and the recovery of rare earth metal such as lithium through the identification of physical properties and structures of advanced new materials at nano-level, and research of three-dimensional structures of solid substance.

Atomic structure imaging | 01

Development of convergence imaging techniques by making use of advanced electron microscopes, and promotion of research collaborations and research support through the studies of nano-bio materials and operation of large scale equipment.

High magnetic field properties | 02

Magnetic and electric characterization of materials under the exposure of high magnetic field, and examination of temperature-dependent reactivities. In addition, nano-technology based convergence research is being carried out for visualizing physical properties of nano- and micro-materials (fluorescence, vibration and crystal structures).

Part material | 03

Development of region-tailored source technologies and lithium secondary cell for cultivation of local part material industries and small businesses. Installation of large research systems for supporting surface analysis and joint research for R&D of industry, academy and institutes.

Energy Nano-materials | 04

Establishment of infrastructure for research systems and expert research human resources essential for nano-technologies, and analysis of NT at world-leading level. Research and development of rare earth metal such as lithium and oxide secondary cell, research support and joint research in the field of new nano-materials.

Development of oxygen atom defect analysis technique

+ Dr. Young-min Kim
[Daedeok Headquarters, Division of Electron Microscopic Research]
+ Joint research with National Oak Ridge R&D Institute in U.S.

Summary

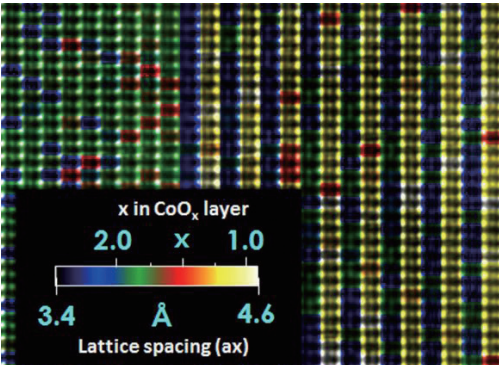
Development of aberration-corrected TEM analysis for the understanding distribution and volume of oxygen atom defects in oxide structure at atomic level by measuring cation expansion distance in functional oxide structure

Posted paper

Probing oxygen vacancy concentration and homogeneity in solid-oxide-fuel-cell cathode materials on the subunit-cell level
Nature Materials 2012, 11, 888-894 (IF:32.841)

Related equipment

Numeric aberration scanning transmittance electron microscope



Example of mapping oxygen atom defect with new TEM technique

Environmental Science

Korea Basic Science Institute



KBSI plays an active role in analytical sciences and techniques for global environmental issues in past and present, such as precise age determination of geological events, prediction of environmental change, and detect of environmental pollution. Environmental science aims to make the Earth more pleasant and better place.

Isotope geochemistry | 01

KBSI operates a variety of advanced research instruments for isotope analysis, which can identify low concentration of isotopic elements in extremely small volume of specimen from earth environment.

Inorganic elemental analysis | 02

KBSI builds strong platform of analytical services for inorganic elemental measurement using analytical equipment such as ICP, XRF and for the structural analysis by XRD. Most inorganic elements(soil, groundwater, ceramics, polymeric materials, metal composites, nano-composites etc...) and metals related to the bio matter can be analyzed precisely. Recent research has focus on the determination of 'fluorine' in many environmental samples.

Geochronology | 03

KBSI has a capability of age determination of Earth and environmental event such as earthquakes, volcanic eruption, circulation of the glacial-interglacial epochs, and intrusion of magma by operating diverse research with radiogenic isotope and luminescence measurements.

Environmental forensics | 04

KBSI established organized analysis systems for types, test methods, exposure conditions and mechanism of in vivo exertion of harmful substances in environment, and built and operates system for precise identification of unknown harmful components by making use of ultra-precision analysis equipment and methods.

Mineralogical and geochemical research on the origin of Palaeolithic cultural layers in Korea

+ Dr. Jeong-Heon Choi
[Ochang Headquarters, Division of Earth and Environmental Science Research]
+ Joint research with Prof. Gi-young Jeong
[Andong National University]

Summary

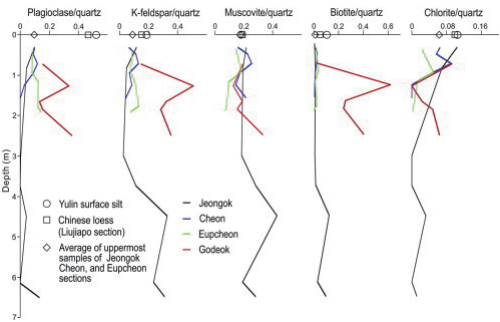
The provenance and transportation mechanisms of palaeolithic cultural layers in Korea are proposed by means of mineralogical and geochemical studies on BCS (Brown Clay Silt) sediments. This study suggests that the constituent mineral grains in BCSs were wind-blown from China and finally deposited in various locations in Korea. This claim provides an excellent scientific basis for the interpretation of OSL ages of BCSs, which will be immediately performed to figure out the ages of Palaeolithic stone tools excavated from the BCSs, and further, to better understand the Palaeolithic human evolution of Eastern Asian regions.

Posted paper

Deposition and weathering of Asian dust in Paleolithic sites, Korea
Quaternary Science Reviews 2013, 78, 283-300 (IF:4.076)

Related equipment

Optically stimulated luminescence (OSL) reader



Variation of mineral facies upon soil profile of layer yielding relics of the Old Stone Age in the Korean Peninsula. Mineral facies in different areas showed identical while moving upward

Disease research using 9.4 T MRI
(Researcher Jun-yong Park, Ochang Headquarters, Division of Magnetic Resonance Research)



Convergence Research

Korea Basic Science Institute



Using world-class research equipment, KBSI has performed joint research with world leading universities and research institutes, leading numerous publication of 1,216 research papers in 2013.

KBSI succeeded in making the world's first identification of the overall metabolic pathways of hyperthermophilic archaea dwelling in deep-sea hydrothermal vents

Summary

Succeeded in finding first in the world that NA1 (*Thermococcus onnurineus* NA1), marine hyperthermophilic archaeon, takes in formic acid or carbon oxide and produces hydrogen as well as organic carbon compound such as glucose and citric acid for continuous proliferation

Posted paper

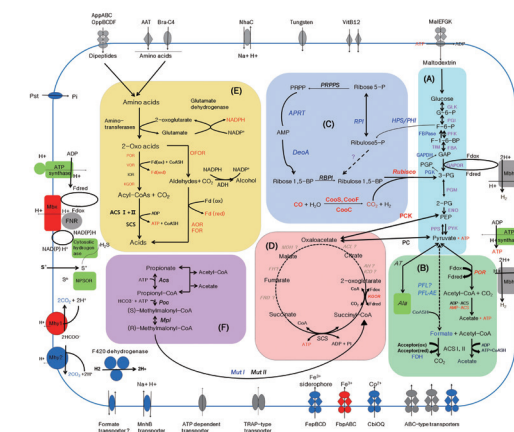
Proteome Analyses of Hydrogen-producing Hyperthermophilic Archaeon *Thermococcus onnurineus* NA1 in Different One-carbon Substrate Culture Conditions

Molecular and Cellular Proteomics. 2012, 11(6), M111.015420. 1-16 (IF: 7.398)

Related equipment

Liquid chromatographic tandem mass analyzer

- + Drs. Young-Ho Chung, Seung Il Kim
(Daedeok Headquarters, Division of Life Sciences Research)
- + Drs. Jung-Hyun Lee, Sung Gyun Kang
(Korea Institute of Ocean Science & Technology)



A general overview of the cellular metabolism in the hydrogen-producing hyperthermophilic archaeon *Thermococcus onnurineus* NA1

Development of optical image technologies of high resolution by making use of non-toxic nano particles

Summary

Found a fact that zinc sulfide nanocrystals illuminating in orange color have unique quantum mechanics called high-resolution three-photon nature material, and succeeded in obtaining high-resolution biomedical images beyond limits of resolution of conventional near infra-red optical microscope by making use of three-photon nature materials of nanocrystals of doped zinc sulfide

Posted paper

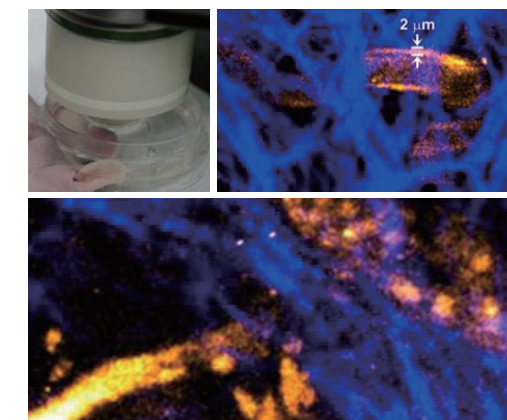
High-resolution three-photon biomedical imaging using doped ZnS nanocrystals

Nature Materials 2013, 12, 359-366 (IF:35.749)

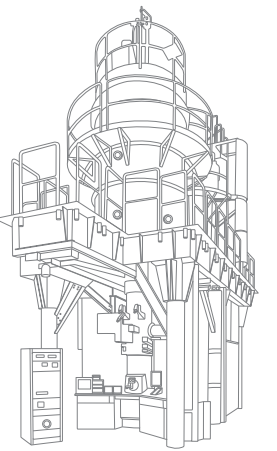
Related equipment

Biomedical confocal laser scanning microscope, multi-photon confocal laser scanning microscope

- + Dr. Seung Hae Kwon (Chuncheon Center)
- + Profs. Taeghwan Hyeon, Jung Ho Yu (Seoul National University)



Providing various specific information of in vivo cancer tissue on high-resolution images



Diagnosis of myocarditis by making use of noninvasive in vivo magnetic resonance image

Summary

Feasibility study for diagnosis of a myocardial inflammation and assessment of the inflammatory evolution stage using cardiovascular magnetic resonance imaging (MRI) combined with magneto-fluorescent magnetic nanoparticles (MNP) in a myocarditis model

Posted paper

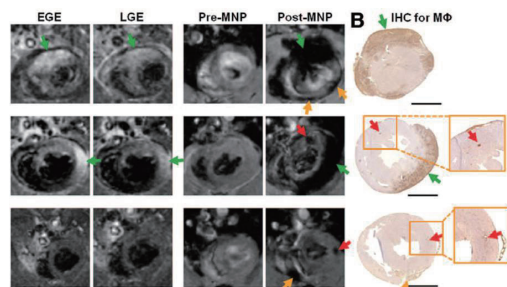
Noninvasive assessment of myocardial inflammation by cardiovascular magnetic resonance in a rat model of experimental autoimmune myo-carditis

Circulation 2012, 125(21), 2603-2612 (IF : 15.202)

Related equipment

4.7 T magnetic resonance imaging instrument

+ **Dr. Kwan Soo Hong** (Ochang Headquarters, Division of Magnetic Resonance Research)
+ **Prof. Kiyuk Chang** (Catholic University)



Comparison results between MNP-MRI and conventional MRI of myocardial inflammation in a myocarditis model

Influence of oxygen deficiency on metal to insulator transition in single-crystalline VO₂ nanobeams

Summary

Demonstration of a morphotropic phase transformation (MPT) in single-crystalline VO₂ nanobeams caused by thermal reduction in a hydrogen environment using thorough experimental analyses that provide the correlation among structural phase transition, compositional variation, and electronic properties in VO₂ nanobeams.

Posted paper

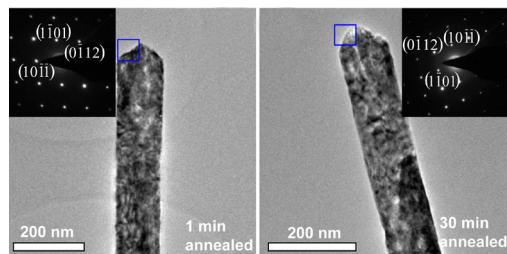
Hydrogen-Induced Morphotropic Phase Transformation of Single-Crystalline Vanadium Dioxide Nanobeams

Nano Letters 2013, 13(4), 1822-1828 (IF : 13.198)

Related equipment

Raman spectrometer, X-ray photoelectron spectrometer, scanning atomic force microscope, transmittance electron microscope

+ **Dr. Woong-Ki Hong** (Jeonju Center)
+ **Prof. Takhee Lee** (Seoul National University),
Dr. Bong-Joong Kim (Gwangju Institute of Science and Technology)



Images and diffraction patterns from transmittance electron microscope

Development of high efficient hydrogen production method by making use of nitrogen-doped monolayer graphen

Summary

Demonstrated chemical composition and characteristics of nitrogen-doped graphene as silicon surface protection; implemented photoelectrochemical efficiency for replacing platinum catalyst for hydrogen production by applying graphene doped with nitrogen on silicon photocathodes.

Posted paper

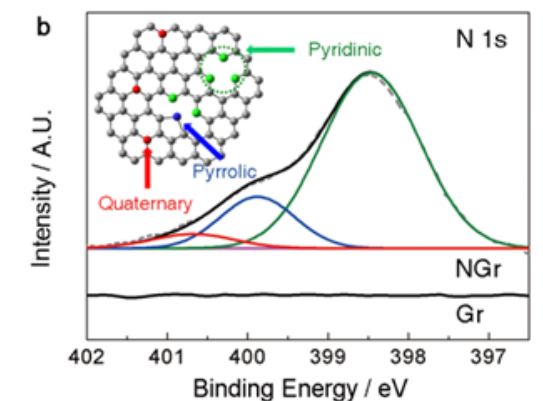
N-doped Monolayer Graphene Catalyst on Silicon Photocathode for Hydrogen Production

Energy & Environmental Science 2013, 6, 3658-3664 (IF=11.653)

Related equipment

X-ray photoelectron spectrometer

+ **Dr. Jouhahn Lee** (Daedeok Headquarters, Division of Materials Science Research)
+ **Profs. Ki Tae Nam** and **Byung Hee Hong** (Seoul National University)



N 1s high-resolution XPS spectrum

Development of high-functionality conductor keeping conductivity intact even upon stretching by two folds or more

Summary

Development of materials of excellent conductivity by precipitating spherical gold nanoparticles in polyurethane of good elongation and flexibility first in the world.

Posted paper

Stretchable nanoparticle conductors with self-organized conductive pathways

Nature 2013, 500, 59-63 (IF=36.28)

Related equipment

High voltage electron microscope

+ **Dr. Jin-Gyu Kim** (Daedeok Headquarters, Division of Electron Microscope Research)
+ **Prof. Nicholas Kotov** (Michigan Univ., U.S.)

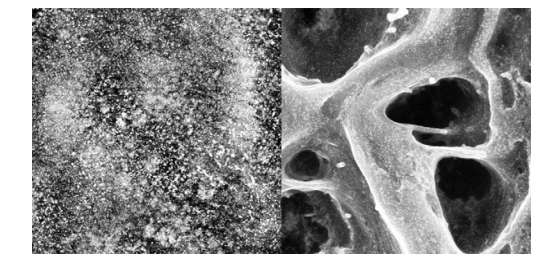
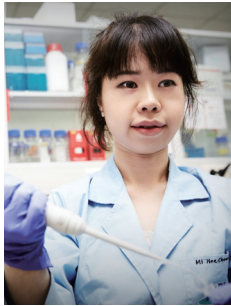


Image of surface of high-elongation conductor taken by electron microscope (left), and image of same surface with doubled elasticity at same magnitude (right).

In-house Research

Korea Basic Science Institute



The researchers at KBSI are executing research of analytical science through in-house research in various fields, and contributing development of basic sciences of Korea through well-defining theories of basic sciences.

Development of coherent electric field method capable of charaterizing molecular chirality in the ultrafast time domain

+ Dr. Hanju Rhee
(Seoul Center)

Summary

Femtosecond laser wave interference method with ultimate sensitivity was developed to monitor chiral signal in the ultrafast time domain.

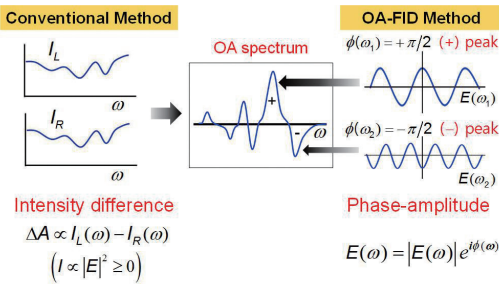
Posted paper

Coherent electric field characterization of molecular chirality in the time domain

Chemical Society Reviews 2012, 41, 4457-4466 (IF:28.76)

Related equipment

UV-visible femtosecond laser system



Comparison of fundamental difference between laser electric field and conventional intensity methods for chirality measurement

Elucidating the structure of copper-amyloid beta peptide relevant to Alzheimer's disease

+ Dr. Sun Hee Kim
(Daedeok Headquarters,
Division of Materials Science Research)

Summary

The structure of the redox-active copper and amyloid beta peptide is identified with 34 GHz Electron Nuclear Double Resonance; This result provides the framework for the development of therapeutic reagents for Alzheimer's disease.

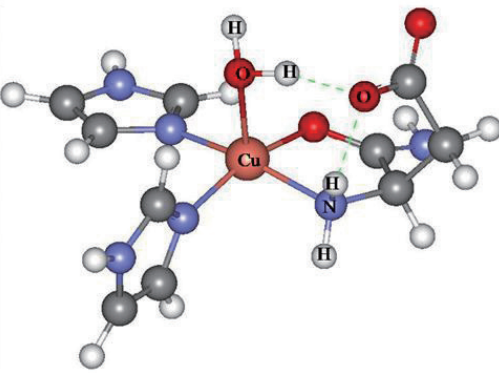
Posted paper

34 GHz Pulsed ENDOR Characterization of Copper Coordination of an Amyloid β Peptide Relevant to Alzheimer's Disease

Angewandte Chemie-International Edition 2013, 52(4), 1139-1142 (IF:13.455)

Related equipment

Electron Paramagnetic Resonance(EPR)



Structure of copper-amyloid obtained from electron phase magnetic resonance

Observation of methanol behavior in fuel cells in situ by nuclear magnetic resonance spectroscopy equipped with home-made probes

+ Dr. Oc Hee Han
(Daegu Center)

Summary

Examining electrochemical reaction of methanol in fuel cells without disassembling the cells was demonstrated using toroid cavity detectors developed-in-house for in situ nuclear magnetic resonance observation, for the first time in the world as far as we know.

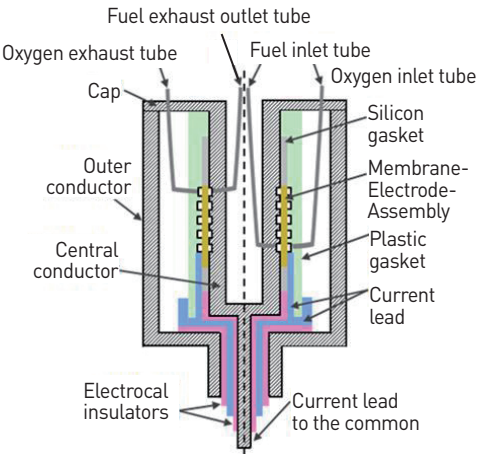
Posted paper

Observation of Methanol Behavior in Fuel Cells In Situ by NMR Spectroscopy

Angewandte Chemie International Edition 2012, 51(16), 3842-3845 (IF:13.455)

Related equipment

Solid state nuclear magnetic resonance spectrometer



Sliced view of the toroid cavity detector used for nuclear magnetic resonance observation of direct methanol fuel cells in situ

Characterization of crustal evolution procedures in the Korean Peninsula by making use of super-precision aging determination

+ Dr. Chang-sik Jeong
(Ochang Headquarters, Division of Earth and Environmental
Science Research)

Summary

Crustal evolution of the NE Yeongnam massif was revealed by SHRIMP zircon U-Pb geochronology: depositions 2.02~2.00 Ga; granitic magmatism ca. 1.95 Ga; metamorphic events 1.89~1.84 Ga.

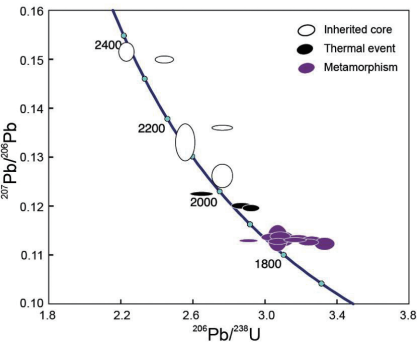
Posted paper

Crustal evolution of northeastern Yeongnam Massif, Korea, revealed by SHRIMP U-Pb zircon geochronology and geochemistry

GONDWANA RESEARCH 2012, 21(4), 865-875 (IF: 6.659)

Related equipment

High-resolution secondary ion mass analyzer
Inductive coupling plasma mass analyzer



Analysis results of SHRIMP U-Pb zircon of migmatite



Research by using of 15 T FT-ICR MS
(Researcher Ik-hyeon Bae at Division of Mass Spectrometry Research, Ochang Headquarters)

World-class research equipment infrastructure

High Voltage Electron Microscope

Daedeok Headquarters, Division of Electron Microscopic Research



Overview

An ultra high voltage transmission electron microscope (HVEM), with which the structure of the atomic unit can be directly observed, has been installed in the Daedeok headquarters, which operates research equipment commonly utilized in the nation in basic and applied science areas, such as structural analysis of new materials and development of infinitesimal materials.

Characteristics of system

- 3-dimensional observation of the atomic structure of materials by concurrently implementing the atomic resolution power (<0.12 nm) and the high tilt angle ($\pm 60^\circ$)
- Implementing the chemical signal detection function with the high collection rate with the state-of-the-art energy filter (HV-GIF) mounted to utilize the relativity effect
- Dynamic lab environment and Cryo-EM analysis equipment with specially manufactured specimen holder
- Capability of collaboration with remote researchers through remote control

HVEM

High Field-Nuclear Magnetic Resonance

Ochang Headquarters, Division of Magnetic Resonance Research



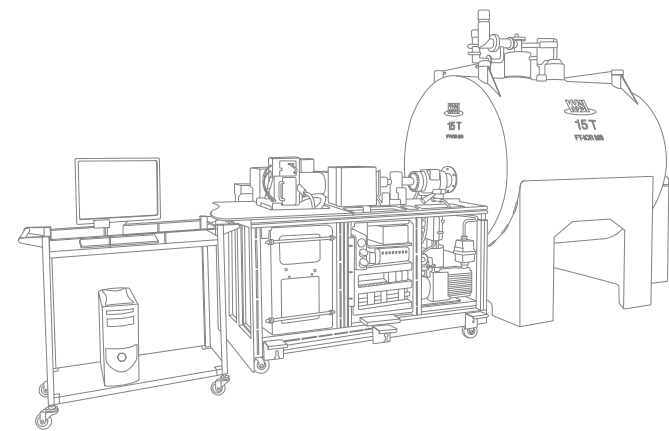
Overview

The 900 MHz, 800 MHz NMR and 4.7 T / 9.4 T MRI for animals have been installed as the core equipment for research in biopolymer solid structure clarification, new medicine development, disease diagnosis, and treatment development and they are operated as research equipment of the national user facilities.

Characteristics of system

- 900 MHz NMR - ^1H sensitivity 7000 : 1, ^{13}C sensitivity 800 : 1 (microanalysis)
- 800 MHz NMR - Analysis of the protein structure and micro-imaging test
- 9.4 T/4.7 T MRI - Animal image test up to 20 cm

HF-NMR



Fourier Transform Ion Cyclotron Resonance Mass Spectrometer

Ochang Headquarters, Division of Mass Spectrometry Research



Overview

The first 15 T FT-ICR MS in the nation was developed to build the base of a world-class mass spectroscopy. The profiles of protein, metabolic bodies, nano complex materials, and petrochemical compounds are prepared with the super high resolution mass spectroscopy and it is operated as a research equipment of the national user facilities to determine the ingredients of complex compounds.

Characteristics of system

- Mass analysis with super-high resolution ($>3,000,000$) at world-highest magnetic field
- Available simultaneous applications to matrix auxiliary laser mounting/demounting, and electron spray ionization
- Molecule image measurement, ACPI, APPI, and multi-dimensional LC/MS
- Various tandem mass analysis and experiments of CID, ECD, ISD and IRMPD

FT-ICR MS

High Resolution-Secondary Ion Mass Spectrometer

Ochang Headquarters, Division of Earth & Environmental Science Research



Overview

The High Resolution Secondary Ionization Mass Spectrometer (HR-SIMS), which measures the isotope ratio for minute area of solid materials, has been installed and operated as research equipment of the national user facilities for soil quality age determination, stable isotope research, and nuclide analysis research.

Characteristics of system

- Cs-gun and aluminum ion distribution pipe exclusively for stable isotopes
- Improved multiple detection device that can concurrently measure even Pu isotopes
- Convenience of remote analysis
- Reproducibility of the uranium-lead age determination within 2%

HR-SIMS

7.0 T MRI

To be installed in the second half of 2014



Overview

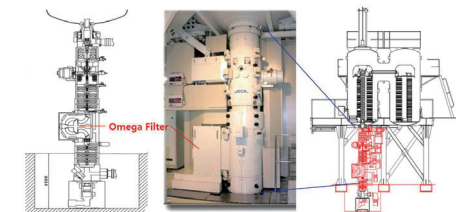
7.0T MRI research system provides the ultra high field strength essential for advanced clinical research in a stable, optimized platform. In particular, 7.0T MRI shares the proven platform of 3.0T clinical system for reproducible research.

Characteristics of system

- Superconductive actively shielded compact 7.0T magnet
- Actively shielded gradient system, and 8 channels RF system
- Ultra-high resolution MRI, fMRI, and MR spectroscopy

Super-bio high voltage electron microscope

To be installed in the second half of 2015



Overview

Advanced high voltage electron microscope customized for biomedical research using direct examination of three-dimensional structure of biological specimen

Characteristics of system

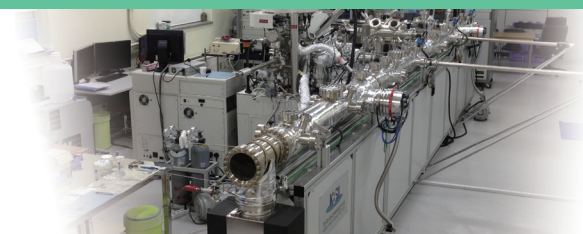
- Enhanced cryo-EM functions for analysis of protein structure at extremely low temperature
- Improved function of automatic high tilt for analysis of 3D structure
- Enhanced system capability by mounting STEM, In-column Ω -filter, and high-resolution DDD camera (4k \times 4k)

Multi-disciplinary in-situ analytical system for nanotechnology

To be installed in the first half of 2016

Overview

The purpose of this system is to provide the total analytical solution both academic and industry by means of establishing the one-line in situ analytical system, consists of high-ends of leading surface analysis instruments with device fabrication process such that XPS/UPS, NAP-XPS, STM, LEEM/PEEM, AR-UPS along with ALD, CVD, Thermal Evaporator and Electrospray. With the combination of the fabrication process and precise analysis instruments, it is expected to set the facilities supporting both the nanotechnology industry and other research groups.



Characteristics of system

- UHV (Ultra High Vacuum) condition : under 10^{-10} torr environment
- In situ Surface Analysis System: XPS, UPS, NAP-XPS, STM, LEEM/PEEM, AR-UPS
- Process Facilities : ALD, CVD, Thermal Evaporator, Electrospray, MBE



Knowledge
Basic
Science
Inquiry

KBSI

Students executing experiments by participating in Junior Doctor Program
[Program of experiencing advanced research infrastructure for juvenile, Division of International & Public Relations, Daedeok Headquarters]

Satisfaction of national needs by utilizing basic science infrastructure

General scientific culture activities ¹⁰¹

KBSI provides youth with a variety of experience programs by making use of advanced systems, scientific technologies, and research personnel, as well as programs utilizing the infrastructure of the Special Zone of Daedeok Research and Development, thereby enhancing interest and understanding of national science and technology, and contributing to the expansion of scientific culture.

X-Science <http://xscience.kbsi.re.kr>

Science program providing opportunities for the general public to understand and appreciate advanced experimental science and technology.

Junior Doctor <http://jrdoctor.kbsi.re.kr>

Junior Doctor Program provides youth around the country with opportunities to visit research institutes in the Special Zone of Daedeok Research and Development and to experience advanced research infrastructure. The goal of the program is to foment adolescent interest in scientific and technological research, so as to cultivate future scientists.

Support of and cooperation with small businesses ¹⁰²

- Fully open research systems to small businesses, and supporting small businesses for test, analysis, measurement, and assessment
- Helping small businesses to develop new products and technologies, and to effect process improvement through joint industry-institute research
- Consulting for technologies for troubleshooting at site of small businesses, and advising on system repair
- Execution of urgent analysis and membership with discounted fee for supporting activities of small businesses
- Cultivating excellent technologies for small businesses while driving technology transfer and commercialization of technologies

Major records (as of 2013)

- Supporting small business for analysis: 604 companies
- Small business R&D project: 13 projects/2.5 billion KRW
- Technology consulting for small business: 301 issues
- Discount member of small business: 48 companies
- Technology transfer for small business, and contract amount: 3 project/290 million KRW

Discussing troubles at sites by making use of experience and know-how of operation of expensive systems

Joint utilization of advanced systems
(537 systems/180.9 billion KRW)
(Statistics of equipment over 30 million Won)

Supporting charge for system operating up to 70% for R&D
(linked with Small and Medium Business Administration)



Supporting activities of small businesses such as permit/approval, production processes, QC, shipping, customers clearing (priority over common analysis)

Discounting charges for system operating by 10 to 40% dependent upon records of research

Graduate School of Analytical Science and Technology, GRAFT

Interview

Heesun Chung, Dean
Graduate School of Analytical Science and Technology (GRAST)

Cultivation of expert human resources for analytical science (GRAST) ¹⁰³

KBSI and Chungnam National University collaborate in the fields of research and education to cultivate knowledgeable personnel with access to the most advanced research equipment and top professors.

KBSI has been developing research equipment and analytic methods, the core of science and technology, based on NT, BT, ET and convergence fields. In addition, KBSI has been conducting research utilizing world-class facilities to cultivate competent experts for equipment operation in the realms of both theory and practice.

<http://grast.cnu.ac.kr>

GRAST is operated jointly by KBSI and Chungnam National University. GRAST is a graduate school where research and education converge, and the best professors and research equipment are utilized to cultivate optimal personnel with integrated knowledge and practical expertise.

National Research Facilities & Equipment Center, NFEC

Collective operation and management of facilities and systems for research projects

- Establishing policies for systematic and strategic introduction of facilities and systems for national researches, promotion of joint utilization of them, and improving investment efficiency through recycling idle or low-utilization systems
- Forming and operating research system budget deliberation committee so as to improve investment efficiency of facilities and systems of national research projects
- Servicing and managing facilities and equipment for national research projects for the purpose of supplying important information and national statistical indexes required for establishing efficient infrastructure policies

National Research System Promotion Center (NFEC) ¹⁰⁴

NFEC was established to provide systematic support of collective operations and management, and to upgrade R&D facilities and systems for the progress of science and technology. NFEC systematically performs such tasks as investment into research facilities and systems, promotion of their common utilization, cultivation of expert personnel, and collective operation and management of the facilities and the systems, and commits its best endeavors into maximizing national R&D production.

<http://www.nfec.go.kr>

Cultivating experts for system operation

- Performing research equipment engineering projects for systematic cultivation of human resources for operation and management of research equipment
- Supporting efficient operation of research equipment, and identifying and operating education programs adequate for specialized equipment and research fields



Real-time status bulletin board of NFEC



The collaboration network with overseas advanced research institutes is accelerating the generation of world-class research results.

Expansion of international joint researches | 06

Continuous promotion of international joint researches with world-leading research institutes for realizing excellent research outcomes in the fields of advanced research equipment and new analytic methods



MOU with Harvard Medical School/Massachusetts Hospital: 2013.9.12

DAEDEOK HEADQUATERS	
1	Micro-XPS (X-ray/Ultraviolet photoelectron spectroscopy)
2	MPMS (Magnetic property measurement system)
3	CPS (Cryogenic probe station)
4	MSB-AD-H (High pressure thermogravimetric analyzer)
5	AFM-RAMAN (Complex AFM-RAMAN spectroscope)
6	500 MHz Solid State NMR spectrometer
7	X-band CW-EPR
8	He Liquefier
9	PPMS 16 T (16 T Physical property measurement system)
10	Micro X-ray / UV photoelectron spectrometer
11	MIS (Microscopic imaging system)
12	CAS (Carbohydrate analysis system)
13	Automatic protein sequencer
14	Fluorometric analysis system
15	LCQ-MS (LCQ-mass spectrometry)
16	MALDI TOF/TOF MS (Matrix-assisted laser desorption/ionization time of flight mass spectrometry)
17	EAS (Expression analysis system)
18	HVEM (High voltage electron microscope)
19	FE-TEM (Field emission transmission electron microscope)
20	Bio-TEM (Bio-transmission electron microscope)
21	EPMA (Electron probe micro-analyzer)
22	EF-TEM (Energy-filtering transmission electron microscopy)
23	ESEM (Environmental scanning electron microscope)
24	HT-XRD (High temperature X-ray diffractometer)
25	FIB (Focused ion beam)
26	Ultra precision freeform generator
27	PSS (Protein sequencing system)
28	LC-MS/MS (Liquid chromatography-quadrupole mass spectrometry)

OCHANG HEADQUATERS	
1	MR micro-imaging (600 MHz & 800 MHz)
2	9.4 T MRI (9.4 T Magnetic resonance imaging)
3	Micro PET/CT systems for molecular imaging
4	300 MHz NMR spectrometer
5	Macromolecular X-ray
6	Macromolecular automatic crystallization system
7	Auto-ITC (Auto isothermal titration calorimeter)
8	Protein synthesizer
9	600 MHz NMR spectrometer
10	CD spectropolarimeter
11	400 MHz NMR spectrometer
12	500 MHz NMR spectrometer
13	4.7 T MRI (4.7 T Magnetic resonance imaging)
14	3 T Human MRI (3 T Human magnetic resonance imaging)
15	800 MHz NMR spectrometer
16	900 MHz NMR spectrometer
17	HR-ESI-MS (High resolution electrospray ionization mass spectrometer)
18	MALDI/MS (Matrix-assisted laser desorption ionization mass spectrometer)
19	LC/ESI-MS (Liquid chromatography/electrospray ionization mass spectrometer)
20	15 T FT-ICR MS (Fourier transform ion cyclotron resonance mass spectrometer)
21	7 T FT-ICR (Fourier transform ion cyclotron resonance mass spectrometer)
22	Triple quadrupole mass spectrometer system
23	Hybrid FT-ETD mass spectrometer system
24	ICP-MS (Inductively coupled plasma mass spectrometer)
25	SIRMS (Stable isotope ratio mass spectrometer)
26	NRMS (Natural radioactivity measurement system)
27	GC-SIRMS (Stable isotope ratio mass spectrometer with gas chromatography)
28	TIMS (Thermal ionization mass spectrometer)
29	SVMS (Static vacuum mass spectrometer)
30	OSL (Optically stimulated luminescence)
31	Ion chromatography
32	SHRIMP (High resolution-secondary ion mass spectrometer)

SEOUL CENTER	
1	Biomolecule analysis system
2	CS (Chromatography system)
3	Protein sequencing system
4	Online LC-MS-NMR System
5	500 MHz NMR spectrometer
6	200 MHz Solid state NMR spectrometer
7	XRD (X-ray DiffractometerX)
8	FE-SEM (Field emission scanning electron microscope)
9	XRF (X-ray fluorecence spectrometer)
10	SQUID Magnetometer
11	AFM (Atomic force microscope)
12	FE-TEM (Field emission transmission electron microscopy)
13	FIB (Focused ion beam)
14	GC-MS (Gas chromatograhly mass spectrometer)
15	LC-MS (Liquid chromatography mass spectrometer)
16	HRMS (High resolution mass spectrometer)
17	ICP-AES (Inductively coupled plasma atomic emission spectrophotometer)
18	ICP-MS (Inductively coupled plasma mass spectrometer)
19	EA (Elemental analyzer)
20	Thermal Analysis System
21	Py-GC/MS (Py-Gas chromatograhly mass spectrometer)
22	LC-TQ/MS (High performance triple quadrupole mass spectrometer)
23	ED-SRF (Energy dispersive XRF)
24	Hybrid-FT orbitrap mass spectrometer
25	Atomic absorption spectrometer
26	IM-MS (Ion mobility mass spectrometer)
27	Multidimensional femto laser spectroscopy system
28	Pump probe ultrafast multidimensional spectrometer
29	UV-Vis Femtosecond laser system
30	700 MHz NMR Spectrometer

BUSAN CENTER	
1	EA (Elemental analyzer)
2	XPS (X-ray photoelectron spectrometer)
3	AES (Auger electron spectroscopy)
4	SPM (Scanning probe microscope)
5	GDS (Glow discharge spectrometer)
6	SIMS (Secondary ion mass spectrometry)
7	PLD (Pulsed laser deposition system)
8	AR XPS (Angle-resolved X-ray photoelectron spectrometer)
9	HR XRD (High resolution X-ray diffractometer)
10	SEM (Scanning electron microscope)
11	TEM (Transmission electron microscope)
12	UV-VIS spectrophotometer
13	ED-XRF (Energy dispersive XRF)
14	GC/MS (Gas chromatograhly mass spectrometer)
15	ICP-AES (Inductively coupled plasma atomic emission spectrophotometer)
16	Combustion IC
17	Nano SIMS (Nano secondary ion mass spectrometer)
18	Thermal analysis system
19	UPLC/MS/MS (Ultra performance liquid chromatography-triple quadrupole tandem mass spectrometry)
20	Microscopic FT-IR/Raman

DAEGU CENTER	
1	400 MHz Solid state NMR spectrometer
2	XRD (X-ray diffractometer)
3	HR-XRD (High resolution X-ray diffractometer)
4	500 MHz NMR spectrometer
5	XRF (X-Ray fluorecence spectrometer)
6	600 MHz Solid-State NMR spectrometer
7	200 MHz Solid-State NMR spectrometer
8	Optical spectrometer
9	HR-MS (High resolution mass spectrometer)
10	EM (Electron microscopy)

DAEGU CENTER	
11	MP-XRD (Multi-purpose X-ray diffractometer)
12	400 MHz Solid State NMR spectrometer
13	UHR-FE-SEM (Field emission scanning electron microscope)
14	HR-MS (High resolution mass spectrometer)
15	MF-XRD (Multi-function X-ray diffractometer)

GWANGJU CENTER

1	UV-VIS-NIR spectrophotometer
2	LRS (Laser raman and photoluminescence spectrometer)
3	FE-SEM (Field-emission scanning electron microscope)
4	Thermal analyzer
5	HR-TEM (High resolution transmission electron microscope)
6	UV-Micro raman spectrometer
7	300 MHz NMR spectrometer
8	ICP-AES (Inductively coupled plasma-atomic emission spectrometer)
9	500 MHz NMR spectrometer
10	600 MHz LC-NMR-MS
11	LCSM (Laser confocal scanning microscope)
12	Multi-functional TEM (Multi transmission electron microscope)
13	SPF Animal facility of aging science
14	High impedance-temperature dependent hall measurement system

JEONJU CENTER

1	FE-SEM (Field emission scanning electron microscope)
2	Particle and pore size analysis system
3	SC-XRD (Single crystal X-ray diffractometer system)
4	AFM (Atomic force microscope)
5	MALDI/MS (Matrix-assisted laser desorption ionization mass spectrometer)
6	EPMA (Electron probe micro-analyzer)
7	Micro-raman spectroscopy
8	UHR-FE-SEM (Ultra high resolution field emission scanning electron microscope)
9	FE-TEM (Field emission transmission electron microscope)

CHUNCHEON CENTER	
1	LV-SEM (Low vacuum - scanning electron microscope)
2	Electrophoretic light scattering spectrophotometer
3	EF-TEM (Energy filtering-transmission electron mircscope)
4	MP-CLSM (Multi-photon confocal laser scanning microscope system)
5	Luminescence and fluorescence animal imaging system
6	IMP-LSM (Intravital multi-photon laser scanning microscope)
7	VP-FE-SEM (Variable pressure field emission scanning electron microscopy)

SUNCHEON CENTER

1	Photoluminescence mapping system
2	XRD (High power X-ray diffractometer)
3	High resolution field emission scannig electron microscope
4	FE-TEM (Field emission transmission electron microscope)
5	DSC (Differential scanning calorimetry)
6	Differential Scanning Calorimetry

GANGNEUNG CENTER

1	FE-SEM (Field emission scanning electron microscope)
2	MP-XRD (Multi purpose X-ray diffractometer)
3	Time-resolved fluorescence confocal microscope
4	FT-UV-VIS-IR spectroscopic imaging microscope
5	FE-TEM (Field emission transmission electron microscope)
6	WD-XRF (Wavelength dispersive X-ray fluorecence spectrometer)

JEJU CENTER

1	OCAS (Organism component separation analysis system)
2	Recycling HPLC with preparation
3	LC-MS (Liquid chromatography mass spectrometer)
4	HS-GCTMS (Head space-gas chromatograph tandem mass spectrometer)
5	High sensitivity spectral laser confocal microscopy system
6	FE-SEM (Field emission scanning electron microscope)
7	ICMS (Inductively coupled plasma mass spectrometry)

The counseling center for analysis service with high-tech equipment

Korea Basic Science Institute

Counseling on repair of systems for small and medium companies			
Team	Consultant	Phone number	E-Mail
Center for Analytical Instrumentation Development	Kyoung-Jae Lee	+82-42-865-3471	kjlee@kbsi.re.kr
	Jeong Min Lee	+82-42-865-3473	ets@kbsi.re.kr
Phone numbers nationwide			
Small and Medium companies Support Team	Jung Im Lee	+82-42-865-3661	jilee@kbsi.re.kr
	Jin Hwang	+82-42-865-3552	hj3462@kbsi.re.kr
	Dong Jin Kim	+82-42-865-3664	kdj0861@kbsi.re.kr

Call center 1577-3639

Division of Life Science Research	Young Ho Chung	+82-42-865-3429	chungyh@kbsi.re.kr
	Gun Hwa Kim	+82-42-865-3649	genekgh@kbsi.re.kr
Division of Materials Science Research	Dong Lak Kim	+82-42-865-3910	dlkim@kbsi.re.kr
	Seung Young Park	+82-42-865-3655	parksy@kbsi.re.kr
Division of Electron Microscopic Research	Jin Gyu Kim	+82-42-865-3961	jjintta@kbsi.re.kr
	Hee Seok Kweon	+82-42-865-3685	hskweon@kbsi.re.kr
Center for Analytical Instrumentation Development	Geon-hee Kim	+82-42-865-3460	kgh@kbsi.re.kr
	Kye Sung Lee	+82-42-865-3436	kslee24@kbsi.re.kr
	Hyo-sik Kim	+82-42-865-3461	hsk@kbsi.re.kr
Division of Magnetic Resonance Research	Eun Hee Kim	+82-43-240-5063	keh@kbsi.re.kr
	Jee Hyun Cho	+82-43-240-5103	jhcho@kbsi.re.kr
Division of Mass Spictrometry Research	Kyung-Hoon Kwon	+82-43-240-5141	khoon@kbsi.re.kr
	Geul Bang	+82-43-240-5035	bangree@kbsi.re.kr
Division of Earth and Environmental Science Research	Jeongmin Kim	+82-43-240-5330	j-mkim@kbsi.re.kr
	Jeong Hee Han	+82-43-240-5332	hanjh@kbsi.re.kr
Seoul Center	Hye On Yoon	+82-2-6943-4192	dunee@kbsi.re.kr
	Jung Joo Seo	+82-2-6943-4191	jjseo@kbsi.re.kr
Busan Center	Jong Seong Bae	+82-51-974-6129	jsbae@kbsi.re.kr
	Myoung Gyu Ha	+82-51-974-6105	mkha@kbsi.re.kr
Daegu Center	Sung Hong Kim	+82-53-950-6766	sunghkim@kbsi.re.kr
	Sang Geul Lee	+82-53-950-6769	sagelee@kbsi.re.kr
Gwangju Center	Won Jin Moon	+82-62-530-0866	wjmoon@kbsi.re.kr
	Young Woo Seo	+82-62-530-0514	whitefox@kbsi.re.kr
Jeonju Center	Tae Sung Bae	+82-63-270-3955	chemipia@kbsi.re.kr
	Young Bu Lee	+82-63-270-3956	yblee@kbsi.re.kr
Chuncheon Center	Seung Hae Kwon	+82-33-250-7279	kwonsh@kbsi.re.kr
	Her Song	+82-33-250-7394	swher@kbsi.re.kr
Suncheon Center	Yang Soo Kim	+82-61-804-4702	kimyangsoo@kbsi.re.kr
	Yun Ju Choi	+82-61-804-4703	yjchoi0512@kbsi.re.kr
Gangneung Center	Jin Kyu Rhee	+82-33-820-4830	jkrrhee@kbsi.re.kr
	Weon Sik Chae	+82-33-820-4820	wschae@kbsi.re.kr
Jeju Center	Dae Kyung Kim	+82-64-800-4930	dkim@kbsi.re.kr
	Chi-Yong Eom	+82-2-3277-5950	cyeom@kbsi.re.kr
Western Seoul Center	Hee Jung Park	+82-2-3277-5951	hjpark8659@kbsi.re.kr

Contact information of the headquarters and the regional centers

Korea Basic Science Institute

Headquarters and regional centers

Daedeok Headquarters	Convergence biometrics, proteomics, electron micrometer, nano-properties, and system development 169-148, Gwahak-ro, Yuseong-gu, Daejeon, Korea [305-806] tel. +82-42-865-3500 fax. +82-42-865-3404
Ochang Headquarters	Magnetic resonance, magnetic resonance imaging, mass analysis, isotope analysis, and aging determination 162, Yeongudanji-ro, Ochang-eup, Cheongwon-gun, Chungcheongbuk-do, Korea [363-883] tel. +82-43-240-5021 fax. +82-43-240-5059
Seoul Center	Metabolomics, environment analysis, and multi-dimensional spectrometry Natural Science Compus, Korea University, Anam Campus, Anam-dong 5-ga, Seongbuk-gu, Seoul Korea [136-713] tel. +82-2-920-0700 fax. +82-2-920-0708
Busan Center	Surface properties, and hi-tech part materials 60, Gwahaksandan 1-ro, Gangseo-gu, Busan, Korea [618-230] tel. +82-51-974-6102 fax. +82-51-974-6116
Daegu Center	Advanced functional materials Joint Experiment & Practice Hall, Kyungpook National University, 80, Daehak-ro, Buk-gu, Daegu, Korea [702-701] tel. +82-53-959-3404 fax. +82-53-959-3405
Gwangju Center	Regressive disease recovery Chonnam National University, 77, Yongbong-ro, Buk-gu, Gwangju, Korea [500-757] tel. +82-62-530-0890 fax. +82-62-530-0519
Jeonju Center	Nano-structure analysis and properties Life Science Hall, Chonbuk National University Hospital, 20, Geonji-ro, Deokjin-gu, Jeonju-si, Jeollabuk-do, Korea [561-712] tel. +82-63-270-4306 fax. +82-63-270-4308
Chuncheon Center	Bio-imaging Jiphyeongwan, Gangwon National University, 1, Gangwondaehak-gil, Chuncheon-si, Gangwon-do, Korea [200-701] tel. +82-33-250-7275 fax. +82-33-255-7273
Suncheon Center	New nano-materials Joint Experiment and Practice Hall, Suncheon University, 255, Jungang-ro, Suncheon-si, Jeolla-nam-do, Korea [540-950] tel. +82-61-752-8154 fax. +82-61-752-8156
Gangneung Center	Nano property imaging Joint Experiment and Practice Hall, Kangnung-Wonju National University, 7, Jukheon-gil, Gang-neung-si, Gangwon-do, Korea [210-702] tel. +82-33-640-2896 fax. +82-33-640-2895
Jeju Center	Marine biometrics 1st floor, Smart Building, Jeju Science Park, 213-3, Cheomdan-ro, Jeju-si, Korea [690-140] tel. +82-64-800-4921 fax. +82-64-805-7800
Western Seoul Center	Nono, bio, and medicine convergence DB 102, Hyundai Motor Building, General Science Hall, Ewha Woman's University, 52, Ehwayeo-dae-gil, Seodaemun-gu, Seoul, Korea [120-750] tel. +82-2-3277-5953

