September, 2015 Date of Issue: September 15, 2015

Superconductivity Web21

Published by International Superconductivity Technology Center
KSP, Kawasaki, Kanagawa 213-0012 Japan Tel:+81-44-850-1612, Fax:+81-44-850-1613

Contents:

Topics: What's New in the World of Superconductivity

Feature Article: Reporting on the 2015 Forum on Superconductivity Technology Trends
- Fujikura's Development of RE-based Coated Conductors
- Superconducting Wires and Product Applications Developed at SWCC Showa Cable Systems
- DI-BSCCO Wires and Associated Product Applications
- Highly Sensitive Magnetometer for Infrastructure Applications
- Trends in Magnetic Prospecting Technology Utilizing SQUIDs
- International Standardization for Superconductivity

Top of Superconductivity Web21

Superconductivity Web21
Published by International Superconductivity Technology Center
KSP, Kawasaki, Kanagawa 213-0012 Japan
Tel:+81-44-850-1612, Fax:+81-44-850-1613
Top of Superconductivity Web21: http://www.istec.or.jp/web21/web21-E.html

This work was subsidized by JKA using promotion funds from KEIRIN RACE
http://ringring-keirin.jp

September 2015 Date of Issue: September 15, 2015

Superconductivity Web21

Published by International Superconductivity Technology Center
KSP, Kawasaki, Kanagawa 213-0012 Japan Tel:+81-44-850-1612, Fax:+81-44-850-1613

What's New in the World of Superconductivity

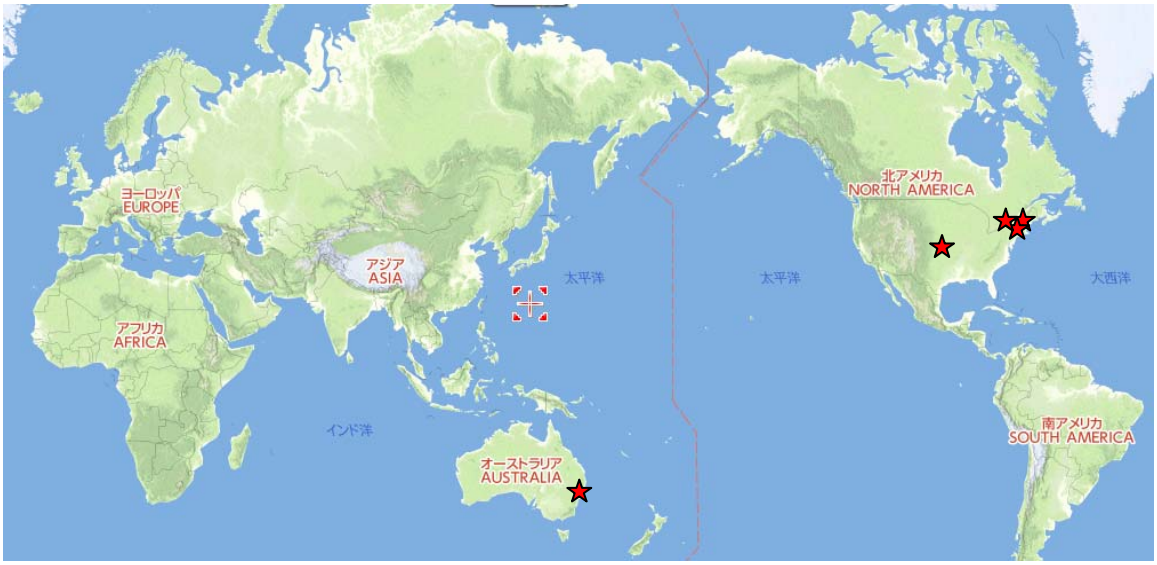
(September, 2015)

초전도 뉴스 –세계의 동향–

超电导新闻 –世界的动向-

chāo diàn dǎo xīnwén - shìjiè de dòngxiàng-

Yutaka Yamada, Principal Research Fellow
Superconductivity Research Laboratory, ISTEC



★News sources and related areas in this issue

▸Power Application 전력응용 电力应用 [diànlì yìngyòng]

Deployment Study of Resilient Electric Grid System

AMSC (9 July, 2015)

AMSC announced that Pepco has undertaken a resiliency study of AMSC's Resilient Electric Grid (REG) system to increase the reliability of distribution system across its service territory, reducing frequency and duration of outages for customers due to severe storms. The plan involves the evaluation of new REG systems technologies that aim to improve resiliency, reliability and capacity of urban grids.

Superconductivity Web21

Published by International Superconductivity Technology Center
KSP, Kawasaki, Kanagawa 213-0012 Japan Tel:+81-44-850-1612, Fax:+81-44-850-1613

AMSC's Resilient Electric Grid system utilizes an innovative approach to underground power distribution system that increases reliability and capacity in urban environments. The REG system allows for greater urban grid reliability of interconnecting substations while also increasing load-serving capacity, something that has not been possible using traditional technologies. Daniel P. McGahn, AMSC President and CEO, stated that, "the REG system may offer additional protection and resiliency to grid serving the D.C. area." Pepco will also join the Homeland Security's REG Utility Group, an industry group working in cooperation with the government focused on securing electricity grids.

Source: "AMSC and Washington D.C.'s Pepco are Undertaking Deployment Study of Resilient Electric Grid System" (9 July, 2015) Press Release
http://ir.amsc.com/releasedetail.cfm?ReleaseID=921430
Contact:Kerry Farrell, Kerry.farrell@amsc.com

▸Industrial Application 산업응용 工业应用 [gōngyè yìngyòng]

EUR 50 million Contract to build magnets for German research facility GSI

ASG Superconductors (30 July, 2015)

ASG Superconductors, the superconductivity company owned by the Malacalza family, has been awarded a new contract by the German research facility GSI (Gesellshaft fuer Schwerlonenforshung-GSI Helmholtz Center for Heavy Ion Research) in the framework of the FAIR project, involving the construction of around ten accelerators and detectors. ASG's technical and industrial expertise has been recognized and awarded a center of excellence in Darmstadt, Germany. For the Italian company, this is the fourth major international order in five years.

The EUR 50 million contract is for the construction of 33 superconducting multiplets, comprising of different magnet configurations to vary particles trajectories passing through a series of dipolar magnets and focus (quadrupole, sextupole and octupole) magnets. The complex devices require bespoke design and production skills, enabling them to work for many years with high precision and operate with an accuracy measured in fractions of a millimeter and millionths of a tesla.

This expertise in research-related projects has been maintained by industrial development and by new products like the magnesium diboride (MgB_2) superconducting cable manufactured by Columbus Superconductors. The magnets produced by ASG will be used for the NUSTAR (NUclear STructure, Astrophysics, and Reactions) experiments to study exotic nuclei.

Source: "Contract worth EUR 50 million to build magnets for German research facility GSI"
(30 July, 2015) Press Release
http://www.asgsuperconductors.com/doc/comunicatoGSI_eng.pdf
Contact: Luca Pezzoni, lpezzoni@hofima.it

▶Medical Application 의료응용 医疗应用 [yīliáo yìngyòng]

Superconductivity Web21

Published by International Superconductivity Technology Center
KSP, Kawasaki, Kanagawa 213-0012 Japan Tel:+81-44-850-1612, Fax:+81-44-850-1613

Cryogen-free Magnet Technology for MRI

MR Solutions (9 July, 2015)

MR Solutions exhibited their 3 T, 4.7 T and 7 T MRI cryogen-free magnet technology for preclinical imaging at the ISMRM 2015 and SNMMI 2015, in June 2015. Also at the exhibitions, was the new PET-MRI technology that allows PET-MRI imaging to be undertaken either simultaneously or sequentially.

The preclinical MRI systems provide greater soft tissue contrast and higher spatial resolution. The system incorporates magnet technology utilizing a superconducting wire eliminating the need for large-scale helium cooling systems and external vents, which would have been necessary for traditionally-built MRI systems, and also allows the system to be located inside a Class 3 or 4 laboratory.

This has revolutionized the preclinical scanning market by lowering costs and eliminating stray magnetic fields to within a few centimeters, allowing placement inside laboratories rather than in purpose-built facilities.

Source: "MR Solutions displays world-leading cryogen-free magnet technology at ISMRM and SNMMI Conferences" (9 July, 2015) Press Release
http://www.mrsolutions.com/news-events/news-item/mr-solutions-displays-world-leading-cryogen-free-magnet-technology-ismrm-snmmi-conferences/
Contact: information@mrsolutions.com

▸Wire 선 재료 线材料 [xiàn cáiliào]

Wire Supply for FCL, Roebel Cable

Superconductor Technologies Inc (20 July, 2015)

Results from multiple customers evaluating and testing STI's Conductus® wires in superconducting fault current limiters (SFCL) demonstrated significant performance improvements compared to tests undertaken earlier. The trials involved an extensive series of tests to simulate the characteristics of the wire performance in the SFCL device, as well as electrical tests replicate the thermal cycling of the superconducting wire in high-current operation.

Customers verified STI's 550 Amp current handling performance characteristics as well as comprehending the mechanical robustness properties of Conductus wires. Additionally, STI successfully completed qualification trials with the Robinson Research Institute at Victoria University of Wellington. Conductus wire is now approved for use in fabricating Roebel cable, a winding cable, which is currently employed in high-field magnets, transformers, utility-scale generators and large motors.

Jeff Quiram, STI's president and chief executive officer, stated that, "Conductus wire is very close to passing all trials, and are encouraged by our customers' confidence. In parallel, we have initiated business discussions to ensure product availability matches demand."

Superconductivity Web21

Published by International Superconductivity Technology Center
KSP, Kawasaki, Kanagawa 213-0012 Japan Tel:+81-44-850-1612, Fax:+81-44-850-1613

Source: " STI Advances Development With SFCL Customers - Completes Qualification of Conductus Wire for Robinson's Roebel Cable" (20 July, 2015) Press Release
http://phx.corporate-ir.net/phoenix.zhtml?c=70847&p=irol-newsArticle&ID=2068941
Contact: Cathy Mattison, invest@suptech.com

►Basics 기초 基础[jīchǔ]

A New Iron-based Compound

Australian Nuclear Science and Technology Organisation (ANSTO) (21 July, 2015)

An international collaboration has identified a new iron-based compound, which demonstrates one-dimensional superconductivity. Until recently, superconductivity in iron-based compounds was only observed in iron pnictides on two-dimensional square lattices. It had been assumed that high-temperature superconductivity only occurred with copper, but in 2008 a new class of similar iron-based superconductors were discovered. The discovery of superconductivity in the ladder-type $BaFe_2S_3$ provides a new platform for investigating the fundamentals of iron-based superconductivity.

Hiroki Takahashi from Nihon University and co-authors from Japan, China and Australia, including ANSTO's Instrument Scientist and adjunct A/Prof of University of Sydney Max Avdeev, published a paper in Nature Materials, which revealed that barium iron sulphide ($BaFe_2S_3$) exhibits superconductivity under pressure (11 GPa), at a temperature below 14 K. By utilizing high pressures, the researchers were able to acquire information regarding microscopic mechanisms at work and the appearance of superconductivity. Their results showed a superconducting transition between 10 and 11 GPa, where there was a sudden decrease in resistance at 13 K.

Experiments at ANSTO, using a high-resolution powder diffractometer Echidna, characterized magnetic ordering in the material at ambient pressures below 119 K. Compound synthesis and characterization of all other physical properties was undertaken by other collaborating organisations, and led by the corresponding authors Hiroki Takahashi (Nihon University) and Kenya Ogushi (University of Tokyo and Tohoku University).

Source: "A step closer to understanding superconductivity with large international collaboration" (21 July, 2015) News
http://www.ansto.gov.au/AboutANSTO/MediaCentre/News/ACS072735
Contact: Phil McCall +61 438 619 987

Top of Superconductivity Web21

September 2015 Date of Issue: September 15, 2015
Superconductivity Web21
Published by International Superconductivity Technology Center
KSP, Kawasaki, Kanagawa 213-0012 Japan Tel:+81-44-850-1612, Fax:+81-44-850-1613

Feature Article: Reporting on the 2015 Forum on Superconductivity Technology Trends
-Fujikura's Development of RE-based Coated Conductors

Yasuhiro Iijima, Director
Superconductor Business Development Department
New Business Promotion Center, Fujikura Ltd.

Fujikura has focused on the high performance attained by RE-based superconductor from the outset and progressed wire development by vapor deposition methods, supported by NEDO. A practically flexible textured IBAD-buffer layer substrates have led to high speed processing of 1 km-class long wires. A homogeneous superconducting layer was realized along 300-500 m wire lengths using PLD (a hot-wall technique), which is essentially an isothermal furnace where radiant heat is uniformly distributed in the deposition chamber. To increase production capacities and also to realize 1 km-long wires, investigations utilizing a larger scale hot-wall type production line equipped with load lock mechanisms are ongoing.

Crystal growth occurs rapidly due to the high energies employed to evaporate materials during PLD, which leads to micro defects that are evenly distributed within the material. Current understanding points towards this being one of the reasons behind the relatively large flux pinning characteristics observed in these materials. In particular, the measured in-field characteristics at low temperature, important attributes when designing coils, scale accordingly with measurements conducted at higher temperatures. Therefore, at operating temperatures, homogenous and longitudinal magnetic fields are predictable advantages. Future fundamental studies include realizing thin films with artificial pinning centres and enhanced homogeneity attributes together with production capacities that would reduce costs – addressing current issues surrounding RE-based wires.

RE-based wires are architecturally weak having poor delamination characteristics. For the production of coil windings by resin impregnation, it is therefore desirable to somehow form a mould release between the resin and wire. Fujikura realized such functionality in 2012 by introducing elaborate impregnation methodologies that preserved mechanical rigidity, and employing 10 mm-width wires over a length of 7.2 km led to the fabrication of 20 cm-bore 5 T-class magnets. There have been two years of trouble free operation with no signs of degradation. As well as wires for coil development, low-cost soldered copper foils that serve as a copper coating have proved commercially viable for enhancing stability characteristics. In addition to using copper plates to shield the entire circumference, new copper forming techniques employing copper foils have been developed to realize greater wire mechanical reliability and their commercial launch is soon planned. A copper-formed wire is currently being studied from the viewpoint of scribing methodologies to enhance wire productivities and reliability, in addition to serving as a protection measure to reduce shield currents, specifically in rectangular wires.

For the future realization of practical RE123 wires for commercial use, studies dedicated to the viability of coil windings and securing their long term reliability are expected as are studies of km-class long wires, and reducing their manufacturing costs. The author believes that a steady stream of fundamental studies should be undertaken.

Top of Superconductivity Web21

September 2015 Date of Issue: September 15, 2015
Superconductivity Web21
Published by International Superconductivity Technology Center
KSP, Kawasaki, Kanagawa 213-0012 Japan Tel:+81-44-850-1612, Fax:+81-44-850-1613

Feature Article: Reporting on the 2015 Forum on Superconductivity Technology Trends
-Superconducting Wires and Product Applications Developed at SWCC Showa Cable Systems

Tsutomu Koizumi, Group Leader
Superconductor Engineering R&D Group
Engineering R&D Center
SWCC Showa Cable Systems Co., Ltd.

SWCC Showa Cable Systems have been dedicated to superconducting wire development and their associated product applications since 1970. The company has been developing high temperature superconducting wires since the discovery of high temperature superconductors in 1988. Present day studies of Y-based coated conductors are ongoing and further reductions in their costs are anticipated.

The company developed Y-based coated conductors under a national project entitled, “Research and Development of Fundamental Technologies for Superconductor Applications,” and successful in producing 500 m-class wires. The Y-based coated conductors are fabricated by TFA-MOD (Trifluoroacetic acid – metal organic deposition), which involves forming the Y-based superconductor on a textured buffer layer grown on highly oriented Ni-alloy substrate. The company employs an in-house batch sintering heat treatment process to crystalize the superconductor. As well as wire fabrication, Y-based coated conductors with artificial pinning centers to improve in-field characteristics have been developed. Here, non-superconducting nanoparticles of $BaZrO_3$ are dispersed into the superconducting layer. Presently, the company is setting up processes to mass-produce these Y-based coated conductors including the buffer layer substrate.

The company has also developed and commercialized current leads as one of their superconductor-associated product lines. Up to now, current leads with more than 1000 leads employing Bi-based bulk superconductors have been sold. However, the weakness of sintered bulk materials to external impacts is an issue and difficulties during the scale-up of the conductor were encountered. Despite this, the introduction of artificial pinning centers has led to the fabrication of low cost and compact superconducting current leads with superior mechanical characteristics. Furthermore, the utilization of superconducting wires with artificial pinning centers has successfully led to the development of superior superconducting current leads that maintain their performance characteristics in a magnetic field environment.

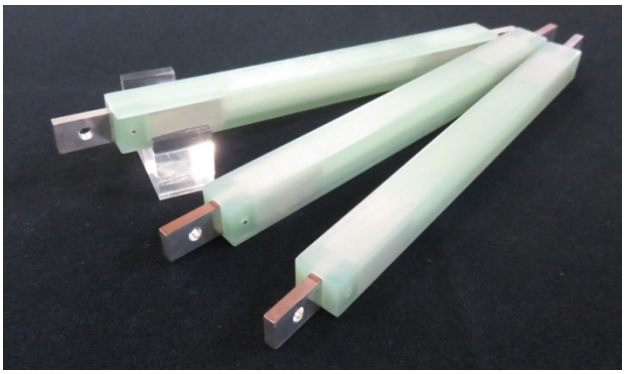


Fig. 1 500 A-class superconducting current leads

Top of Superconductivity Web21

September 2015 Date of Issue: September 15, 2015

Superconductivity Web21

Published by International Superconductivity Technology Center
KSP, Kawasaki, Kanagawa 213-0012 Japan Tel:+81-44-850-1612, Fax:+81-44-850-1613

Feature Article: Reporting on the 2015 Forum on Superconductivity Technology Trends
-DI-BSCCO Wires and Associated Product Applications

Takeshi Kato, General Manager
Application Development Department,
Superconductivity Technology Division,
Sumitomo Electric Industries, Ltd.

Since their successful commercial launch, Bi-based high temperature superconducting wires have been utilized in an array of products. Improvements to increase tensile strengths have been necessary to broaden the range of applications. Ultra-high strength Bi-based high temperature superconducting wire, TypeHT-NX, developed by the company has tensile strengths of 400 MPa, which is 50-60 % greater than conventional high strength Bi-based high temperature superconducting wires. This has allowed their application in large-bore magnets and in ultra-high magnetic field environments exceeding 20 T, able to challenge large electromagnetic forces that have not been possible using conventional high strength wires. Greater current density operation can therefore be realized over conventional products leading to other advantageous benefits. These include being able to fabricate compact coils, which can thus reduce the size of individual system components. The permissible bending diameter has also been successfully reduced by 30 % compared to conventional wires, permitting the fabrication of more compact coils with bending diameters of up to φ40 mm.

Wire type	Type HT-NX
Average width	4.5±0.2 mm
Average thickness	0.31±0.03 mm
Permissible tension (RT)	410 N *
Permissible tensile strength (77 K)	400 MPa *
Permissible tensile strain (77 K)	0.5 % *
Permissible bending diameter (RT)	40 mm *

The author introduces a conduction-cooled superconducting magnet system as its product line-up. The results measured at room temperature in a 10 T magnetic field and with a φ300 mm bore diameter are summarized in the table. Such measurements at room temperature with this bore diameter are affected by the degree of tensile strength of the wires. The utilization of 3ply wires laminated by soldering reinforcement materials as in the above-mentioned TypeHT-NX, makes it possible to fabricate magnets exhibiting superior strength and large bore diameter characteristics.

Magnet model	MS 6 T-70	MS 10 T-100	MS 5.7 T-150	MS 5 T-300
Field strength	±6 T	±10 T	±5.7 T	±5 T
Room-temperature bore diameter	Φ70 mm	Φ100 mm	Φ150 mm	Φ300 mm
Magnetization/demagnetization speeds	6 T/30 sec.	10 T/10 min.	5 T/50 sec.	5T/180 sec.
Operating current	250 A	250 A	250 A	250 A
Inductance	1 H	11 H	5 H	20 H

Superconductivity Web21

Published by International Superconductivity Technology Center
KSP, Kawasaki, Kanagawa 213-0012 Japan Tel:+81-44-850-1612, Fax:+81-44-850-1613

In particular, the MS 6 T-70 system listed in the table is specifically designed to evaluate magnetic field characteristics. It is aimed at B-H curve tracers and vibrating sample magnetometers (VSM) applications for practical use. The system weighs only 100 kg, 1/4 that of a conventional system, with dimensions of 0.8 m depth x 0.3 m width x 0.3 m height, being significantly downsized by 1/5. The system realizes greater magnetization/demagnetization speeds of 6 T/30 seconds, a 20 % improvement from the current record of 5 T/30 seconds realized by a conventional system. The cryocooler can be stopped over the permissible coil operating temperature range while still allowing magnetization/demagnetization, and also maintaining the magnetic field strength without cryocooler vibration.

Conduction cooled magnet DI-BSCCO-MS 6 T-70

Top of Superconductivity Web21

September 2015 Date of Issue: September 15, 2015
Superconductivity Web21
Published by International Superconductivity Technology Center
KSP, Kawasaki, Kanagawa 213-0012 Japan Tel:+81-44-850-1612, Fax:+81-44-850-1613

Feature Article: Reporting on the 2015 Forum on Superconductivity Technology Trends
-Highly Sensitive Magnetometer for Infrastructure Applications

Keiji Tsukada, Professor
Graduate School of Natural Sciences and Technology
Okayama University

Many countries have realized rapid post-war economic growth, producing infrastructure such as transportation that include roads, railways, bridges, airports, and harbors, as well as energy facilities and chemical plants. Some of these facilities are now over a half-century old and there are visible signs of age, which is leading to social issues particularly pertaining to safety. Non-destructive methods are being employed to diagnose the health of such ageing facilities, utilizing magnetometers such as eddy current methods, X-rays, and ultrasound examinations. Conventional magnetometers are classified as surface flaw detectors since they cannot acquire sub-surface information due to the skin effect from the applied ac. Since a normal-conducting search coil serves as the detector there is a need to increase frequency during operation. The recent rapid progress of electronic devices has produced many highly sensitive magnetic sensors that measure using dc. These include Magneto Resistive Device (MR), fluxgate magnetometer, hall-effect device, and Superconducting Quantum Interference Device (SQUID), and have been realized for practical use. However, these magnetic sensors have yet to be employed for actual non-destructive applications. For SQUIDs in particular, their potential in non-destructive applications was disregarded because of the associated complexity of necessary ancillary facilities such as the cryocooling system. Recent years has seen that many magnetic sensors have shifted from digital to analogue applications. Whilst these sensors are now supplied cheaply, SQUIDs can easily be employed because of the high temperature superconductors. The author and his research team have commenced R&D studies under a project launched in October 2014 and entitled “Cross-ministerial Strategic Innovation Promotion Program,” for a highly sensitive magnetometer system using MR and SQUIDs able to detect and measure sub-surface defects that have not been possible using conventional methods. Okayama University, (Tsukada Laboratory), is leading and overseeing the entire R&D in cooperation with ISTEC, (Tanabe, Director General), who are responsible for the HTS-SQUID device and system. Japan Power Engineering and Inspection Corporation, (Furukawa, Deputy Director General) are responsible for the optimization of measurement methods by electromagnetic simulation studies, and Kyushu University, (Enpuku Laboratory) are responsible for the optimization and addressing the inverse problem of the superconducting measurement system. Many steel building architecture such as bridges are facing cracks at and around joints due to loads, and corrosion due to standing water internally within the structure because of wind and rain. Nondestructive internal inspections allow observation of internal corrosion, which may not be spotted externally. The size and depth of such internal flaws needs to be measured accurately, and therefore, a highly sensitive measurement method is required. The specimen is subjected to an ultra-low frequency magnetic field and the resultant variation in the secondary magnetic field by eddy currents generated inside the test specimen is measured. Detection occurs either by direct measurements using a magnetic sensor or by transferring the magnetic flux to a magnetic sensor employing a pick-up coil. Here, a conventional normal-conducting pick-up coil requires many wire windings. Instead, employing superconducting wires significantly reduces the resistance and greater sensitivity measurements can be realized, especially at low

Published by International Superconductivity Technology Center
KSP, Kawasaki, Kanagawa 213-0012 Japan Tel:+81-44-850-1612, Fax:+81-44-850-1613

frequencies. The SQUID itself or combined with a superconducting pick-up coil would allow the new nondestructive inspection system to be applicable for detecting cracks in girders or in defects in bridge foundations initiated from the above-surface driving pavement, i.e. large lift-off testing specimens. Although the system is still at an early R&D stage, the author has provided a summary and the prospects of the new nondestructive detection R&D project.

Top of Superconductivity Web21

September 2015 Date of Issue: September 15, 2015
Superconductivity Web21
Published by International Superconductivity Technology Center
KSP, Kawasaki, Kanagawa 213-0012 Japan Tel:+81-44-850-1612, Fax:+81-44-850-1613

Feature Article: Reporting on the 2015 Forum on Superconductivity Technology Trends
-Trends in Magnetic Prospecting Technology Utilizing SQUIDs

Akira Tsukamoto, Senior Research Scientist
Materials/Physics & Electronic Devices Division
SRL/ISTEC

1. Introduction

Magnetic exploration is one of the geophysical prospecting methods used to study underground features using the Earth's magnetic field. Potential applications include underground resource exploration, archaeological prospection, and hazardous material exploration for unexploded ordnance and mines. The development of magnetic prospecting systems is currently ongoing, employing highly sensitive SQUIDs.

2. Overseas trends

Recently, research teams in Germany and Australia have progressed the development of magnetic prospecting technology. A team from Leibniz Institute of Photonic Technology (IPHT), based in Jena, Germany, have been particularly active and has led to a commercial launch of magnetic exploration system by a venture spin-off, Supracon AG[1)]. A 10-unit transient electromagnetic (TEM) exploration system for underground resource exploration is currently in operation in Canada. Regarding airborne magnetic exploration systems (utilizing low-temperature SQUIDs), projects such as the diamond exploration project is ongoing in collaboration with one of the world's largest mining companies, Anglo American. A magnetic exploration system (utilizing low-temperature SQUIDs) placed on a car trailer has successfully mapped the sub-surface Mongol prairies and discovered ancient ruins. In Australia, CSIRO has developed and supplied an exploration company with a system and license. In addition to the TEM system designed for underground resource exploration, the development of exploration system for unexploded ordnance in marine and full tensor gradiometer trials are currently ongoing[2) 3)].

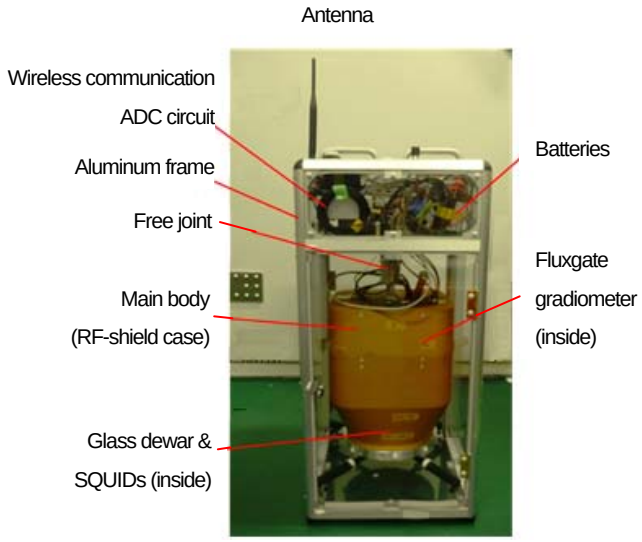


Fig.1 Prototype magnetic prospecting system

3. Gradiometer utilized for metal resources exploration

Metallic ore deposits are magnetized by the Earth's magnetic field. The induced field is superimposed on the Earth's magnetic field measured at the ground surface. A gradiometer to measure local changes in the Earth's magnetic field has been developed by ISTEC and commissioned by JOGMEC (Figure 1). The system is housed in a 35 cm-wide and 70 cm-tall case weighing 25 kg, and is portable using two persons. System control and data collection is wireless and performed using a notebook PC. The sensor is

Superconductivity Web21

Published by International Superconductivity Technology Center
KSP, Kawasaki, Kanagawa 213-0012 Japan Tel:+81-44-850-1612, Fax:+81-44-850-1613

suspended from the frame of the system to maintain the sensor attitude to the Earth's gravitational field. The two sensors employ a thin film gradiometer that is directly coupled to a large-scale flux transformer (baseline of 20 mm), allowing simultaneous measurements of the tangential gradient field components (dBz/dx and dBz/dy) of the vertical magnetic field (Figure 2). Connection with the flux transformer has improved the field variation sensitivity by around one-digit and realized noise levels of 8 pT/m/Hz (10 Hz). Field trials were undertaken at Nakaosaka old magnetite mine[4] located at Shimonita-cho, Gunma prefecture this February. Field differences corresponding to geological maps were successfully attained, however, several issues were also identified.

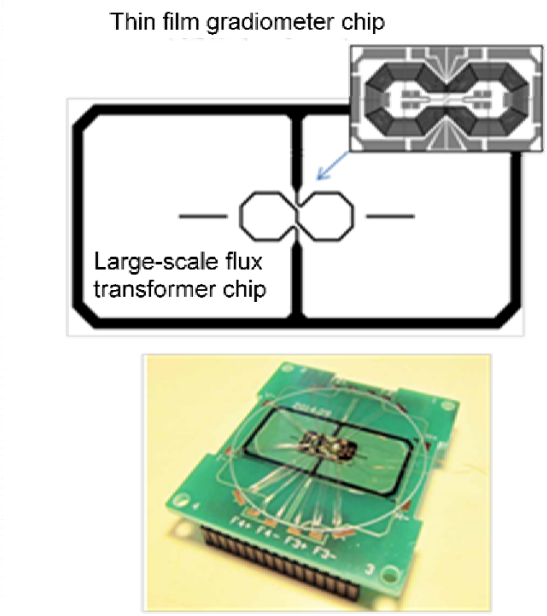


Fig. 2 Structure and photo of gradiometer employed

Acknowledgement: This research was supported by Japan Oil, Gas and Metals National Corporation (JOGMEC), as part of mineral exploration technology development project funded by the Ministry of Economy, Trade and Industry.

References:

1) http://www.supracon.com/en/geophysical.html
2) http://www.csiropedia.csiro.au/display/CSIROpedia/LANDTEM
3) S. T. Keenan *et al*., Supercond. Sci. Technol. 23(2010) 025029.
4) http://www.town.shimonita.lg.jp/kyouiku/m02/m06/01.html

Top of Superconductivity Web21

September 2015 Date of Issue: September 15, 2015
Superconductivity Web21
Published by International Superconductivity Technology Center
KSP, Kawasaki, Kanagawa 213-0012 Japan Tel:+81-44-850-1612, Fax:+81-44-850-1613

Feature Article: Reporting on the 2015 Forum on Superconductivity Technology Trends -International Standardization for Superconductivity

Kenichi Sato/Jun Fujikami
Sumitomo Electric Industries, Ltd.

1. International Standards

The de jure standard endorsed by IEC and ISO, and forum standards established by industrial consortia are recently referred to as “consensus standards” as a whole drawing attention to the part pertaining to intellectual property. Contrary to de facto standards, which gathered attention briefly in the past, consensus standards cannot be decided by a sole company. Also, consensus agreements take time to approve and restrictions arise when incorporating patent technologies into standards. Therefore, the value of consensus standards has not been always recognized.

Recent studies have analyzed and highlighted two major advantages afforded by international standards. In parallel with securing the company’s own technological patent rights, international standardization activities as part of global corporate activities have been recognized as an effective method to, 1) expand international markets during the initial stage of product development, and 2) reduce costs during the business expansion period of the product. International standardization is therefore one of the technological development strategies that are inevitable for future corporate activities. An international standardization is thus obliged as being fundamental to each country’s standards under the WTO “Technical Barriers to Trade”.

From an individual corporate point of view, their technology development strategies need to be set according to what should be standardized, and what should be non-standardized under their business model, including intellectual property.

2. International standardization activity for superconductivity at IEC/TC90

The International Electrotechnical Commission (IEC) was founded in 1906, having a head office in Geneva, Switzerland, and at present regular members from 59 countries. The TC90: Superconductivity, was founded in 1989 as the 90th organization of the Technical Committee (TC). Japan became the Secretariat of TC90 for the first time at TC level in IEC, and has published 22 international standards regarding superconductivity, mainly initiated by Japan. Kick-off activities include standardizing measuring techniques for evaluating performance characteristics of superconductors as expressed by the words of the IEC’s first President, Lord Kelvin, “If you cannot measure it, you cannot improve it”, and definition of technical terms. The activities dedicated until now are summarized as follows:

- Manufacturers make International standards. The number of proposals from Japan has led IEC standards to be set and made public.
- An approximate 10-yr run-up period is deemed necessary to realize international standardizations in a new field.

Published by International Superconductivity Technology Center
KSP, Kawasaki, Kanagawa 213-0012 Japan Tel:+81-44-850-1612, Fax:+81-44-850-1613

- Co-operation with the existing International bodies already undertaking pre-standard activities is deemed effective. (VAMAS*, CIGRE)
  (*Agreement with the Versailles Summit regarding advanced materials and standardization)
- Efforts required in forming agreements with persons related to future direction of standardization.
  (The panel on international standards was regularly held)

Top of Superconductivity Web21