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What's New in the World of Superconductivity

초전도 뉴스 –세계의 동향–

超导新闻 –世界的动向-

chāo 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]

Korea Test of High Voltage DC Superconductor Cable

AMSC (29 Oct, 2014)

Korea Electric Power Corporation (KEPCO), LS Cable & System, and AMSC successfully energized a high voltage direct current (HVDC) HTS cable on KEPCO's real smart grid demonstration site in Jeju Island. HVDC HTS cables have high power density capabilities, thus are ideal for transporting large amounts of power underground within a minimal footprint.

The 500-meter, 80 kV DC cable comprises AMSC's Amperium® HTS wire. Daniel P. McGahn, President and CEO, AMSC, stated " "With the energizing of the HVDC cable at Jeju Island, KEPCO and LS Cable

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have taken another step forward in upgrading Korea's electricity network and fulfilling KEPCO's vision of securing a world-class competitive edge through the development of green and smart technologies." Ja-Eun Koo, President and CEO, LS Cable & System is stated as saying, "The HVDC superconducting cable system offers transmission performance superior to that of alternating current (AC) systems. Interest in this technology has been building up in Asia, the United States and Europe, where new power network implementation is needed". He believes that Korea is the earliest country in the world to implement smart grid, Energy Storage System (ESS), and micro grid. "The energizing of the first DC HTS cable demonstrates KEPCO's commitment to developing world-class, leading edge technologies," said Hwan-Eik Cho, President & CEO, KEPCO.

By utilizing AMSC's Amperium HTS wire, KEPCO is also conducting testing for 1km-class 154 kV AC cable system. In was only back in 2011, when KEPCO, LS Cable & System, and AMSC energized a 22.9 kV AC cable system at the I'cheon substation located near Seoul, operating successfully for two years. KEPCO anticipates that future cable designs will be capable to transporting 10 gigawatts (GW) of power within an 8-meter footprint.

Source: "Korea Energizes High Voltage Direct Current (HVDC) Superconductor Cable"
(29 Oct, 2014) Press Release
http://ir.amsc.com/releases.cfm
Contact: Kerry Farrell, kerry.farrell@amsc.com

World's longest HTS cable in Essen

RWE (27 Oct, 2014)

The world's longest superconducting cable measuring 1 km has exceeded all expectations. It was commissioned on 30 April this year and has now been live for 4,300 hours, delivering around 20 million kilowatt-hours of electricity, around 10,000 Essen households. This was a positive interim report by RWE and its project partners on AmpaCity's first six months. "Operations have so far proceeded smoothly. We have gained valuable knowledge of this technology, which has helped us improve the whole superconductor system further," reported Dr. Joachim Schneider, Technical Director at RWE Deutschland. There have been changes to system monitoring to ensure smoother integration into Essen's grid protection system, as well as adaptations to the cable cooling circuit.

The Parliamentary State Secretary to the Federal Minister of Economics and Energy, Uwe Beckmeyer, stated on his visit to Essen that, "The energy transition calls for bold innovation. We need to design an efficient and secure system to meet tomorrow's energy needs. So we had no hesitation in choosing this excellent project for sponsorship under our energy research programme." It was funding from the German Federal Ministry for Economics and Energy that enabled the flagship project to go ahead. Since then, AmpaCity has been the focus of attention worldwide. Delegations from China, France, Ghana, Japan and the USA have already visited Essen to find out more about the technology on location. The 10,000-volt superconducting cable replaces a conventional 110,000-volt power line, thus making it possible to decrease the numbers of substations and thereby making available valuable inner-city land.

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The Ministry contributed EUR 5.9 million of total project costs of EUR 13.5 million, co-investing with RWE and its partners Nexans and the Karlsruhe Institute of Technology (KIT). Nexans designed a superconducting short-circuit current limiter for field trial demonstrations, supported by KIT.

Source: "World's longest superconductor cable yields first new technological knowledge" (27 Oct, 2014) Press Release
URL: http://www.rwe.com/web/cms/en/113648/rwe/press-news/press-release/?pmid=4012082
Contact: Sebastian Ackermann, sebastian.ackermann@rwe.com

▸ Accelerator 加速器 [jiāsùqì] 가속기(加速氣)

Canada's Superconducting Electron Linear Accelerator

TRIUMF (7 Oct, 2014)

TRIUMF's newly constructed superconducting electron linear accelerator (e-linac), generated its first particle beam at an initial energy of 23 MeV. This is a series of recent successes for the Advanced Rare Isotope Laboratory (ARIEL) project, making it one of the most sophisticated rare-isotope facilities in the world and is internationally recognized for its cutting-edge technical and scientific capabilities. ARIEL's e-linac comprises of many sophisticated systems including superconducting radiofrequency (SRF) accelerator cavities that must operate at extreme tolerances in order to deliver the beam effectively.

The successful completion of the project is the result of a remarkable collaboration between TRIUMF, Canadian industry, and 13 Canadian universities led by the University of Victoria, who contributed on building, installing, and commissioning the e-linac. The Government of British Columbia funded the project through the BC Knowledge Development Fund (BCKDF), jointly with the Government of Canada through the Canadian Foundation for Innovation (CFI), and the National Research Council Canada through TRIUMF and in-kind contributions. "This is a tremendous accomplishment for these scientists, their teams, and for British Columbia," said Minister of Technology, Innovation and Citizens' Services Andrew Wilkinson. He trusts that British Columbia is set to become a global leader in the field of superconductors and rare-isotope research.

The next phase of the ARIEL project will further expand the collaboration to 19 Canadian universities and five provincial governments. New partnerships will be formed with industries, which will offer greater opportunities for the training of the next generation of scientists and engineers. The plans for ARIEL over the next five years include advancing scientific and technical capabilities that will culminate in even greater societal and economic benefits for Canada, making TRIUMF an international hub for cutting-edge rare-isotope research. In fact, the Variable Energy Cyclotron Centre (VECC) in Kolkata, India and TRIUMF has signed a joint partnership to develop accelerator and isotope production technologies for each facility.

Source: "Canada's Superconducting Electron Linear Accelerator Produces First Beam"
(7 Oct, 2014) TRIUMF News Release
URL: http://www.triumf.ca/sites/default/files/NR_2014-10-07-ARIEL_BEAM-vFINAL_0.pdf

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▸Industrial Application 산업응용 工业应用 [gōngyè yìngyòng]

18 Tesla Bulk Magnet

University of Cambridge (22 Oct, 2014)

Cambridge University's bulk superconductivity group, led by Professor David Cardwell, who earlier this month was appointed head of the university's department of engineering, says that the large magnetic fields that have been employed in Maglev train technology could hold the key to improving treatment of serious illnesses and in cancer treatment.

Professor Cardwell stated, "We try to make bulk superconductors generate large magnetic fields." It was only earlier this year that the group generated the highest magnetic field ever recorded in a superconductor of 18 tesla. The Cambridge team broke the record using a disc-shaped gadolinium barium copper oxide superconductor, cooled above the boiling point of liquid nitrogen.

The most high profile use of this technology is in Maglev applications, for example Shanghai Maglev and the SCMaglev in Japan. Maglev trains remain expensive to build, with the Shanghai Maglev costing $1.2bn, and estimated costs of SCMaglev are around $100m per km of track. Such high costs prevent the use of Maglev trains becoming more widespread according to Professor Cardwell, who states that, "it would be hugely expensive and take a long time to build a Maglev railway network, but we'll see superconductors being used more widely, particularly in healthcare." Applications envisaged include smaller MRI scanners that could be installed at local doctors' surgeries rather than being available only at hospitals.

Professor Cardwell added, "There's also the possibility of using them in cancer treatment. If you can insert something magnetic into the body, it could be used to direct treatment to the part of the body which is affected by the cancer, rather than treating the whole body as we do at the moment. This could potentially reduce the side effects for patients. We could see this sort of technology come into use in the next few years."

Source: "Cambridge University's bulk superconductivity group says levitating train tech could be used in cancer treatment" (22 Oct, 2014) Cambridge News
URL:http://www.cambridge-news.co.uk/Cambridge-University-s-bulk-superconductivity/story-23341897-detail/story.html
Contact: reception@eng.cam.ac.uk

▸Management and Finance 경영정보 经营信息[jīngyíng xìnxī]

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KIT and BASF Open a New Lab.

BASF(23 Oct, 2014)

The Karlsruhe Institute of Technology (KIT) and Deutsche Nanoschicht GmbH (a BASF subsidiary) have signed relevant cooperation agreements to develop bespoke high-temperature superconductors for energy applications such as current limiters and transformers for public power grids, power cables for urban supply networks and coils for generators and electric motors. The joint venture between the two partners will see the opening of a new laboratory that will be based at the Institute for Technical Physics of KIT in early 2015, to optimize and tailor superconducting thin film conductors for individual applications. For example, superconductor characteristics will need to be adapted for applications that would be applicable to AC, high current density and strong magnetic field environments.

"KIT has extensive knowledge about the synthesis and use of superconductors. Cooperation with KIT therefore ideally complements our activities in building up our growth field E-Power Management," says Dr. Stefan Blank, Managing Director, BASF New Business GmbH. Dr. Michael Bäcker, Managing Director of Deutsche Nanoschicht GmbH adds that, "Our unique coating technology will make it possible to manufacture superconductors with the price-performance ratio required for them to be more applicable throughout the energy sector". Prof. Dr. Bernhard Holzapfel of the Institute of Technical Physics at KIT will supervise the new laboratory.

Source: “Tailored superconductors for energy technology”
(29 Oct, 2014) Joint News Release
URL: http://www.basf.com/group/pressrelease/P-14-379
Contact: Vanessa Holzhauser BASF, Vanessa.holzhaeuser@basf.com

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