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What's New in the World of Superconductivity (July)

Power

American Superconductor Corporation (July 12, 2006)

American Superconductor Corporation (AMSC) has received a US $1.3 million contract extension from the U.S. Department of Defense's Office of Naval Research for the development of its second-generation (2G) HTS wire. This is the sixth contract or contract extension that AMSC has received for 2G HTS wire development over the last 10 months, bringing the total contract amount to approximately $8.1 million. AMSC's 2G HTS wire will be used in electric motors and generators for ship propulsion, degaussing cable systems, non-lethal weapons, and power distribution systems for warships. Greg Yurek, Chief Executive Officer of AMSC, commented, "Department of Defense decision makers are aware of the revolutionary impact of HTS wire. Our current work with Northrop Grumman on the development of a 36.5MW motor is a perfect example. As a result of the inclusion of our wire, we are able to build a propulsion motor that is just as powerful as similar copper-based systems, is less than half the size and one- third the weight and has much higher fuel efficiency. HTS wire will offer similar advantages in other military systems as well as in a broad range of utility and industrial applications."
Source:
"American Superconductor Receives $1.3 Million Contract for 2G HTS Wire from the U.S. Department Of Defense"
American Superconductor Corporation press release (July 12, 2006)
http://phx.corporate-ir.net/phoenix.zhtml?c=86422&p=irol-newsArticle_Print&ID=881164&highlight

Oak Ridge National Laboratory (July 19, 2006)

A high-temperature superconducting wire technology developed at Oak Ridge National Laboratory (ORNL) has won a nanotechnology award. The technology, referred to as "HTS Wires Enabled via 3D Self-assembly of Insulating Nanodots," received a Nano 50 Award from Nanotech Briefs, a digital magazine for design engineers. The technology enables high supercurrents to be sustained in the presence of a large applied magnetic field by creating columns of self-aligned "nanodots" composed of nonconductive material within the superconductor. These nanodots pin the magnetic vortices caused by magnetic fields, which would otherwise disrupt the energy distribution and counteract the material's superconducting properties. The technology should be applicable to motors, generators, air defense systems, and other applications involving the presence of large applied magnetic fields. The research was sponsored by the Department of Energy's Office of Electricity Delivery and Energy Reliability.
Source:
"ORNL scientists noted for nanotech"
Oak Ridge National Laboratory press release (July 19, 2006)
http://www.ornl.gov/info/press_releases/get_press_release.cfm?ReleaseNumber=mr20060719-00

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Intermagnetics General Corporation (July 24, 2006)

Intermagnetics General Corporation previously announced that it is being acquired by Philips Holding USA Inc., a subsidiary of Koninklijke Philips Electronics, N.V. The waiting period under the Hart-Scott Rodino Antitrust Improvements Act of 1976 has now expired for this transaction. Completion of the acquisition remains subject to satisfaction or waiver of conditions and terms of the merger agreement, European regulatory approval, and the approval of Intermagnetics' shareholders. The merger should be completed during the fourth quarter of calendar 2006.

Source:

"Acquisition of Intermagnetics by Philips Clears U.S. Antitrust Regulatory Review Waiting Period"
Intermagnetics General Corporation press release (July 24, 2006)
http://www.igc.com/News%20_%20Events.aspx?NewsID=29

American Superconductor Corporation (July 25, 2006)

American Superconductor Corporation (AMSC) announced that it has, for the first time, achieved commercial levels of electric current in long lengths (over 300 feet [91.4 m]) of second-generation (2G) HTS wires using a low-cost industrial process. This achievement marks the emergence of this technology into the marketplace. Greg Yurek, Chief Executive Officer of AMSC, commented, "This is a major breakthrough in electricity. It is the first-ever, commercial grade 2G wire that has been produced by a high volume, low-cost, scalable industrial process. I expect that this achievement will have a significant impact on the future of power grids worldwide… Because of the advances in electrical performance we are achieving day after day with 2G wire and with the continuous reductions we are driving in manufacturing costs, we expect the price-performance ratio of 2G wire to be equivalent to that of copper by the end of the decade." AMSC will continue to ramp up its 2G wire manufacturing capacity to meet a growing demand for this product. At present, they have produced longer than 90-meter lengths of commercial-grade 2G wires in widths of about 4 mm that are capable of conducting 140 A.

Source:

"American Superconductor Announces Major Breakthrough in Electricity with Its 2G Wire"
American Superconductor Corporation press release (July 25, 2006)
http://phx.corporate-ir.net/phoenix.zhtml?c=86422&p=irol-newsArticle_Print&ID=885868&highlight

BOC and SuperPower (July 25, 2006)

On July 20, 2006, the world's first in-grid superconducting power cable went online in Albany, New York. The 350-meter HTS cable is presently operating at 34,500 V, with a nominal current carrying capacity of 800 A. The cable, developed by SuperPower in partnership with Sumitomo Electric Industries and BOC, presently utilizes first-generation BSCCO-based HTS wire, but a portion of the system will be replaced with a cable utilizing second-generation YBCO-based HTS wire in a second phase of the demonstration (to begin about one year from now). The second-generation HTS conductor is expected to be more cost-efficient and commercially viable than the first-generation wire. The Albany demonstration is expected to provide power to more than 70,000 households. The operation of the HTS cable will be monitored by BOC from its remote operating center in Bethlehem, Pennsylvania.

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"Superconducting system provides three to five times more power capacity"
BOC press release (July 25, 2006)
http://www.boc.com/news/2006/July/barticle_1255_25jul06.asp
"UNIQUE HIGH-TEMPERATURE SUPERCONDUCTING CABLE PROJECT IS ON-LINE IN ALBANY, NEW YORK"
SuperPower News Update (July 25, 2006)
http://www.igc.com/SuperPower/News%20_%20Events.aspx?NewsID=16

SuperPower (July 25, 2006)

SuperPower and two other partners (Sumitomo Electric Industries Ltd. and BOC) have agreed to continue developing a superconducting fault current limiter (SFCL) to protect utility grids from damaging power surges. The development will be based on SuperPower's previously designed, built, and tested proof-of-concept prototype. The new prototype will be designed for transmission level voltages and will utilize SuperPower's second-generation HTS wire; in the final phase of the project, a three-phase prototype will be installed at a substation of American Electric Power for an extended field trial. Last year, the SFCL program was deferred because of the insufficient reliability of the first-generation elements used in the prototype and other problems. SuperPower has now overcome these obstacles and is eager to resume the program; Philip J. Pellegrino, president of SuperPower, commented, "We have conducted tests using 2G material at both SuperPower and at a high-power test laboratory that indicate our material is superior to the melt-cast material used in the proof-of-concept prototype with respect to the key parameters of reliability, response time, recovery under load and energy absorbed. We also have received additional funding from government and private sources, in-kind contributions from our partners and have a related research agreement with a national laboratory."
Source:
"SUPERPOWER AND PARTNERS RESUME DEVELOPMENT OF INNOVATIVE SUPERCONDUCTING 'POWER VALVE' TO PROTECT UTILITY GRIDS"
SuperPower News Update (July 25, 2006)
http://www.igc.com/SuperPower/News%20_%20Events.aspx?NewsID=15

SuperPower (July 25, 2006)

SuperPower has reported on its recent progress in the scale-up of manufacturing efforts for the routine production of long lengths of second-generation HTS wire to the 2006 Annual DOE Peer Review. The company has achieved a critical current performance level of 470 A/cm in meter-long segments and a critical current uniformity of more than 5% over lengths of 200 meters (more than 3% in some 200-meter long pieces) using a high-throughput process. Significant improvements in wire performance have also been attained for a 4-mm wide conductor with a critical current threshold of 100 A over a length of 270 meters (corresponding to an engineering current density of 26,000 A/cm^2). Philip J. Pellegrino, president of SuperPower, commented, "Processing improvements made in the past several months that have led to these significant performance improvements have allowed the inventory of qualified 2G HTS wire for the second phase of the Albany Cable Project to reach more than 12,000 meters, with wire lengths and critical current performance levels far exceeding those specified." In other areas, SuperPower also reported that high-field coils fabricated from second-generation HTS wires have achieved a

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magnetic field of 1.1 Tesla at 77 K and 2.4 Tesla at 64 K. The company has also achieved a 90% improvement in engineering current density in short samples, compared with their results for a year ago; this corresponds to 100,000 A/cm^2 at self-field and 21,0000 A/cm2 at 1 T and 75 K.
Source:
"SUPERPOWER CONTINUES TO SET THE PACE OF GLOBAL LEADERSHIP IN SECOND GENERATION HIGH-TEMPERATURE SUPERCONDUCTING WIRE PERFORMANCE, LATEST ACCOMPLISHMENTS REPORTED AT DOE PEER REVIEW"
SuperPower News Update (July 25, 2006)
http://www.igc.com/SuperPower/News%20_%20Events.aspx?NewsID=31

Electronics

HYPRES (July 20, 2006)

HYPRES Inc. has received a Small Business Innovation Research (SBIR) Phase II Plus contract worth US $800,000 from the Department of Defense (DOD) to support the development of a compact cryocooler and a superconducting 2 MHz – 2 GHz direct-conversion all digital receiver. Both of these components are key to the company's ongoing goal of developing the first all-digital transceiver (ADT) for wireless communication. The ADT will be capable of digitizing multiple radio signals at RFs directly from an antenna and digitally combine and pre-distort outgoing signals at RF frequencies, a process known as "wideband direct-digitization." The device will provide orders-of-magnitude performance gains and cost reductions for numerous DOD programs.
Source:
"HYPRES receives $800K to further develop cryopackage and superconductor analog-to-digital converter for defense communications"
HYPRES press release (July 20, 2006)
http://www.hypres.com/pages/new/bnew_files/pr_72106_CC_ADRplusups_Final.pdf

National Institute of Standards and Technology (July 20, 2006)

The National Institute of Standards and Technology (NIST) has completed a 10-year effort to develop a precision instrument for directly measuring AC voltages. The instrument is based on the same Josephson junction technology used in NIST's DC voltage standards. An array of junctions (over 130,000 on a single chip) is used to generate AC pulses in precisely measured voltage units over a range of audio frequencies. Arbitrary waveforms can be generated at different voltage levels for different applications. The application can be used to realize an entirely new method of AC metrology, improving measurement accuracy by as much as 1000-fold at low voltages, compared with conventional measurement techniques. Researchers at NIST and Northrop-Grumman first developed the concept for the device in the mid-1990s. The presently available AC instrument has a maximum output of 100 millivolts, but researchers hope to eventually increase the output to 1 volt.
Source:
"Road to AC voltage standard leads to important junction"
National Institute of Standards and Technology press release (July 20, 2006)
http://www.nist.gov/public_affairs/techbeat/tb2006_0720.htm#road

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Communication

ISCO International, Inc. (July 27, 2006)

ISCO International, Inc., has announced its second-quarter financial results. Revenue for the second quarter increased to US $3.4 million, compared with $2.5 million for the second quarter in the previous fiscal year. The company received in excess of $5 million in customer orders during the second quarter and entered their third quarter with $1.8 million in order backlog, compared with a negligible backlog at the same point in the previous fiscal year. Net loss for the quarter was $1.2 million, compared with $0.8 million for the previous fiscal year. Product gross margins for the quarter were approximately 40%.
Source:
"ISCO INTERNATIONAL REPORTS FINANCIAL RESULTS FOR THE SECOND QUARTER 2006 AND UPCOMING INVESTOR CALL"
ISCO International, Inc. press release (July 27, 2006)
http://www.iscointl.com/news.htm

Basic

National Institute of Standards and Technology (July 6, 2006)

Scientists at the National Institute of Standards and Technology (NIST)'s Center for Neutron Research (NCNR) in collaboration with physicists at the University of Tennessee and Oak Ridge National Laboratory have reported strong evidence that magnetic fluctuations are key to the pairing of electrons enabling the resistance-free passage of electric current in high-temperature superconductors. Using neutron probes, the team observed magnetic resonance in an electron-doped, carefully engineered sample of PLCCO. Importantly, the resonance energy was found to obey a well-established relationship universal to high-temperature superconductors, irrespective of type. In this manner, a fundamental link between magnetism and the superconducting phase was demonstrated. The group's findings are expected to encourage the development of a variety of technologies that are presently considered impractical for conventional high-temperature superconductors, including loss-free systems for storing and distributing electric energy, superconducting digital routers for high-speed communications, and more efficient generators and motors. Their research was reported in the July 6, 2006, issue of Nature.
Source:
"Researchers peg magnetism as key driver of high-temperature superconductivity"
National Institute of Standards and Technology press release (July 6, 2006)
http://www.nist.gov/public_affairs/releases/magnetism_key.html

(Akihiko Tsutai, Director, International Affairs Department, ISTEC)

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