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What's New in the World of Superconductivity (August, September)

Shinya Hasuo, Senior Research Fellow
Superconductivity Research Laboratory, ISTEC

NY superconductivity technology summit

SuperPower (August 5, 2011)

General Electric, Philips, SuperPower, and IEEE have hosted the Second New York State Superconductor Technology Summit to celebrate the 100th anniversary of the discovery of superconductivity. The summit was attended by business leaders, public officials, and prominent scientists and engineers from the Capital Region and New York State. At the summit, world-class speakers from industry, academia, and government discussed the current and future impact of superconductor technologies and explored unique opportunities for benefiting from business opportunities related superconductor technologies. Twenty-three honorees were recognized for their work in superconductivity in New York state including Dr. Ivar Giaever, a 1973 Nobel Prize winner for his discovery of tunneling in superconductivity; Carl H. Rosner, founder of Intermagnetics General Corporation (Latham, NY), manufacturer of the superconducting magnets at the heart of the Philips MRI systems; Richard Hitt of Hypres (Elmsford, NY), who drove the development and demonstration of superconducting electronics prototypes; Dr. Venkat Selvamanickam of SuperPower (Schenectady, NY), a pioneer in the development and commercialization of high-temperature superconductor wire; and Dr. William Sampson of Brookhaven National Laboratory (Upton, NY) for his work in designing and building superconducting magnets for particle beam accelerators. Regarding the summit, Traute Lehner, Senior Director of Marketing at SuperPower Inc., commented, "As the applications of superconductivity expand from the low temperature regime of MRI for healthcare to devices that operate at higher temperatures, we are seeing the important benefits that can be achieved from superconductivity in a wide range of other applications such as energy, in particular. Much of this work is enabled by the superconductor wire being produced in Schenectady, New York and shipped to companies around the world engaged in developing these clean, green and smart new systems. SuperPower is proud to be part of New York State's high tech community."
Source:
"NY BUSINESS & TECHNOLOGY LEADERS CELEBRATE CENTENNIAL ANNIVERSARY OF SUPERCONDUCTIVITY"
SuperPower press release (August 5, 2011)
http://www.superpower-inc.com/content/ny-business-technology-leaders-celebrate-centennial-anniversary-superconductivity

Award

Fermi National Accelerator Laboratory (August 16, 2011)

Alex Romanenko, a materials scientist at Fermi National Accelerator Laboratory, has received a $2.5 million grant (over 5 years) from the Department of Energy's Office of Science to expand his innovative

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research to develop superconducting accelerator components applicable to a variety of fields including medicine, energy, and discovery science. The Early Career Research Program award was given for Romanenko's research on the properties of superconducting radio frequency (SRF) cavities made of niobium metal. This prestigious annual award is given to promising researchers in the early states of their careers. Romanenko's work may explain why some superconducting cavities are highly efficient at accelerating charged particles to high speeds while others are not, as well as identifying new ways to make such cavities even more powerful. Specifically, Romanenko is investigating how specific defects and impurities in the niobium cavities affect the performance of the SRF cavities. Romanenko explained, "The technology of these cavities has developed so fast recently that it is ahead of the corresponding science. We know how to make them work to a certain level of performance, but do not necessarily understand the full physics behind why they do so. I hope to understand why cavities behave in certain ways first, improve on this and then apply what I learn to other materials."
Source:
"Fermilab scientist receives $2.5 million award for innovative accelerator work"
Fermi National Accelerator Laboratory press release (August 16, 2011)
http://www.fnal.gov/pub/presspass/press_releases/2011/SRF-Research_20110816.html

GE Global Research (August 30, 2011)

GE Global Research, the technology development arm of the General Electric Company, has begun work on the first phase of a 2-year, US $3 million project from the U.S. Department of Energy to develop a next-generation wind turbine generator capable of supporting large-scale wind applications in the 10 – 15-MW range. Keith Longtin, Wind Technology Leader of GE Global Research, commented, "With the industry's desire for higher megawatt machines to maximize clean wind power opportunities in the U.S. and around the globe, new technologies will be needed to support larger scale wind platforms. The key challenge will be delivering solutions that achieve the right scale and cost. Applying more than 30+ years of experience with superconducting magnets for MRI systems in healthcare, we're developing an innovative new generator technology that will deliver more power while at the same time helping to reduce the cost of wind power." Longtin further explained, "For MRI systems, we're applying superconducting magnets to make lower cost systems with higher image quality. For wind turbines, we want to apply them to generate more wind power at a lower cost of electricity. The applications are different, but the basic technology is the same." The application of superconducting technology to wind turbines is expected to enable significant improvements, with reductions in the size and weight of the generator, reductions in speed, and increases in torque. GE's superconducting machine design will utilize a novel architecture and proven cryogenic cooling technology, improving the reliability of the overall machine. The Oak Ridge National Laboratory will partner with GE on this project.
Source:
"GE Applying MRI Magnet Technology to Cost-effectively Scale-Up to 15MW Wind Turbines"
GE Global Research press release (August 30, 2011)

Personnel affairs

American Superconductor Corporation (August 16, 2011)

American Superconductor Corporation (AMSC) has appointed John W. Wood Jr. as the new

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chairman of its Board, effective August 16, 2011. Mr. Wood will replace the former chairman and company founder Gregory J. Yurek, who retired earlier this year. Mr. Wood has been an independent director of AMSC since 2006. Prior to joining AMSC's Board, he was the chief executive officer of Analogic Corporation, (a designer and manufacturer of medical imaging and security systems). He has a master's degree in electrical engineering from Massachusetts Institute of Technology. As part of his new duties at AMSC, Mr. Wood will act as chairman of AMSC's Nominating & Corporate Governance Committee. His previous role as chairman of the Audit Committee will be assumed by Pamela F. Lenehan.
Source:
"John W. Wood Jr. Appointed Chairman of the Board at American Superconductor"
American Superconductor Corporation press release (August 16, 2011)

Settlement

Superconductor Technologies Inc. (August 10, 2011)

Superconductor Technologies Inc. (STI) has reported its financial results for its second fiscal quarter ending July 2, 2011. Total net revenues for the second quarter were US $1.1 million, compared with $2.4 million for the same period in the previous fiscal year. The net loss for the second quarter was $3.2 million, compared with $3.1 million for the same period in the previous fiscal year. Jeff Quiram, STI's president and chief executive officer, commented, "While we expect to experience ongoing weakness in our commercial wireless business, we continue to make impressive progress in our second generation (2G) HTS wire initiative. Earlier this year, STI demonstrated our capabilities as an HTS wire producer by delivering tested and validated wire samples. Several target customers have verified the world-class technical performance of our HTS wire. This technical success has generated growing interest in our HTS wire, and we continue to receive requests for wire samples from prospective customers." Quiram added, "At this time, we are focused on securing commercial agreements to supply STI's wire for existing applications and new emerging products. We have purchased capital equipment that will enhance our ability to make the longer lengths of wire that our customers require. In addition, we have put in place a financing mechanism that we believe will provide STI capital as we continue to implement our 2G HTS wire program while limiting dilution for our current shareholders." As of July 2, 2011, STI had $12.7 million in cash and cash equivalents and a backlog of $94,000.
Source:
"Superconductor Technologies Reports Second Quarter 2011 Results"
Superconductor Technologies Inc. press release (August 10, 2011)
http://phx.corporate-ir.net/phoenix.zhtml?c=70847&p=irol-newsArticle&ID=1594987&highlight

American Superconductor Corporation (August 11, 2011)

American Superconductor Corporation (AMSC) has reduced its global workforce by approximately 30% (equivalent to 150 positions) and its annualized expenses by approximately $30 million since March 31, 2011. The reductions were made to better align costs with the company's revenue expectations, which have been affected by contractual issues with AMSC's largest customer, Sinovel Wind Group Co., Ltd. (China). AMSC President and Chief Executive Officer Daniel McGahn commented, "These workforce reductions are necessary to maintain the health of the business in the wake of our business and contractual issues with Sinovel. Expenses have been reduced in virtually all departments, levels and major

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geographies, but we have focused on limiting the impact on customer-facing and research and development functions, which are integral to our growth and diversification initiatives."
AMSC expects to report a significant net loss on revenues of less than $10 million for the fiscal quarter ending June 30, 2011. The company intends to submit a plan to the NASDAQ Stock Market that will outline how AMSC intends to regain compliance with the NASDAQ Stock Market listing rules. The company is continuing to work on its restated financial statements for the fiscal quarters ending September 30, 2010 and December 31, 2010 as well as its financial statements for the fiscal quarters ending March 31, 2011 and June 30, 2011.
Source:
"American Superconductor Announces Workforce Reduction"
American Superconductor Corporation press release (August 11, 2011)

American Superconductor Corporation (August 18, 2011)

American Superconductor Corporation (AMSC) has received a letter from the Listing Qualifications Department of the NASDAQ Stock Market advising the company that it is not in compliance with NASDAQ listing rules because of its inability to file its Quarterly Report for the period ending June 30, 2011, on a timely basis. The notification was issues in accordance with standard NASDAQ procedures and in connection with a previous notification letter regarding the company's inability to file its Annual Report for the fiscal year ending March 31, 2011. The notification letter will not have any immediate effect on the listing of AMSC's common stock.
AMSC requires additional time to complete and audit its financial statements, including restatements of its financial results for the fiscal quarters ending September 30, 2010 and December 31, 2010. AMSC has already sent a detailed letter to NASDAQ describing its plan to regain compliance and requesting an extension of time to file the required reports.
Source:
"American Superconductor Receives NASDAQ Notification Letter"
American Superconductor Corporation press release (August 18, 2011)

American Superconductor Corporation (September 23, 2011)

American Superconductor Corporation (AMSC) has reported its financial results for fiscal year 2010, ending March 31, 2011, as well as those for the first quarter of fiscal year 2011, ending June 30, 2011. The company has now filed the corresponding Annual and Quarterly Reports with the Securities and Exchange Commission and expects to regain compliance with the NASDAQ Listing Rules as a result.
Revenues for fiscal 2010 totaled US $286.6 million, compared with $316.0 million for fiscal 2009. The net loss was $186.3 million. The fiscal 2010 revenues include the impact of applying a cash basis of accounting to recognize revenue for shipments to certain customers in China as of September 1, 2010, and for shipments to Sinovel Wind Group Co., Ltd. as of October 1, 2010. AMSC's fiscal 2010 net loss includes $158.5 million in aggregate one-time asset write-downs, impairments, and accrued charges recorded mainly during the fourth quarter based on a judgement that the company's relationship with Sinovel would not continue.
Revenues for the first quarter of fiscal 2011 were $9.1 million, compared with $97.2 million for the first quarter of fiscal 2010. The reduction is mainly due to the lack of revenue from Sinovel. The net loss for the quarter was $37.7 million. Net of the advance payment of approximately $20.6 million for the company's proposed acquisition of The Switch Engineering Oy, AMSC's balance of cash, cash equivalents,

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marketable securities, and restricted cash was $166.2 million as of June 30, 2011. AMSC President and Chief Executive Officer Daniel McGahn commented, "Our financial results for fiscal 2010 and the first quarter of fiscal 2011 are a reflection of our past. Our efforts to build a better AMSC are now well underway. We have reduced our cost structure by more than $30 million annually and realigned our business into market-facing Wind and Grid segments. We also have won nearly $100 million in new contracts since the start of our fiscal year, which we believe will help expand our customer base, diversify our revenue streams and return the company to growth."

At present, AMSC expects its revenues for the present quarter ending September 30, 2011, to exceed $18 million. The net loss, including charges for litigation against Sinovel and previously announced restructuring expenses, is expected to amount to less than $38 million. Despite the company's severance and litigation expenses and supply-chain liabilities, AMSC expects to end the second quarter of fiscal year 2011 with more than $100 million in cash, cash equivalents, marketable securities and restricted cash.

Source:

“AMSC Reports Full-Year Fiscal 2010 and First Quarter Fiscal 2011 Financial Results”

American Superconductor Corporation press release (September 23, 2011)

Helium gas price

Air Products (August 15, 2011)

Air Products has announced a price increase of 15% for liquid and bulk helium gases in North America, effective September 1, 2011. The pricing adjustment is in response to ongoing strong demands amidst significant reductions in supply. The U.S. Bureau of Land Management has implemented product allocations, and many other global helium sources are operating at below capacity. Additionally, most new helium sources are located outside of the U.S. and are extremely expensive, resulting in increased wholesale prices for crude and processed liquid helium. Demand for helium is expected to continue exceeding supply for the next two to three years, creating ongoing shortages in this market.

Source:

“Air Products Announces North America Price Increase for Liquid and Bulk Helium Gases”

Air Products press release (August 15, 2011)

Quantum Computing

National Institute of Standards and Technology (August 10, 2011)

Physicists at the National Institute of Standards and Technology (NIST) have, for the first time, linked the quantum properties of two separated ions by manipulating them using microwaves, rather than laser beams, suggesting that it may be possible to replace an exotic room-sized quantum computing “laser park” with a miniaturized, commercial microwave technology similar to that used in smart phones. While microwaves have been previously used to manipulate single ions, the present work is the first to position microwave sources within 30 micrometers of the target ions, which is close enough to create conditions enabling entanglement (a quantum phenomenon expected to be crucial for transporting information and correction errors in quantum computers). The experimental set-up integrates wiring for microwave sources directly on a chip-sized ion trap and uses a desktop-scale table of lasers, mirrors, and lenses about

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one-tenth of the size of previously required set-ups. Compared with the complex, expensive laser sources that were previously used, the microwave components could be expanded and upgraded more easily to build practical systems of thousands of ions for quantum computing and simulations. Dietrich Leibfried, NIST physicist, commented, "It's conceivable a modest-sized quantum computer could eventually look like a smart phone combined with a laser pointer-like device, while sophisticated machines might have an overall footprint comparable to a regular desktop PC. Although quantum computers are not thought of as convenience devices that everybody wants to carry around, they could use microwave electronics similar to what is used in smart phones. These components are well developed for a mass market to support innovation and reduce costs." The use of microwaves also reduces errors introduced by instabilities in lase beam pointing and power, as well as laser-induced spontaneous emissions by the ions. Nevertheless, the microwave operations must be further improved to enable practical quantum computations or simulations. In the present experiment, the researchers achieved entanglement 76% of the time; while this result is well above the minimum threshold of 50% required to define the onset of quantum properties, it is not yet competitive with the results of optimal laser-controlled operations (99.3%). The group's work was described in the August 11 edition of Nature.
Source:
"NIST physicists 'entangle' 2 atoms using microwaves for the first time"
National Institute of Standards and Technology press release (August 10, 2011)
http://www.nist.gov/pml/div688/microwave-quantum-081011.cfm

University of California – Santa Barbara (September 1, 2011)

Physicists at the University of California Santa Barbara have demonstrated a new paradigm in quantum information processing. The physicists demonstrated a quantum integrated circuit that implements the quantum von Neumann architecture, in which a long-lived quantum random access memory can be programmed using a quantum central processing unit, all constructed on a single chip. This architecture can provide the key components necessary for a quantum version of a classical computer. The reported hardware is based on a superconducting quantum circuit and must be cooled to display quantum behavior. The integrated circuit includes two qubits, a quantum communication bus, two bits of quantum memory, and a resetting register to comprise a simple quantum computer. Matteo Mariantoni, a postdoctoral fellow in the Department of Physics, commented, "Computational steps take a few billionths of a second, comparable to a classical computer, but the great power is that a quantum computer can perform a large number of calculations simultaneously. In our new UCSB architecture, we have explored the possibility of writing quantum information to memory, while simultaneously performing other quantum calculations." The group's work, which shows that quantum large-scale-integration is within reach, has been published online in Science Express.
Source:
"UCSB physicists demonstrate the quantum von Neumann architecture"
University of California – Santa Barbara press release (September 1, 2011)
http://www.physics.ucsb.edu/news/announcement/548-090211

Strong magnetic field

Los Alamos National Laboratory (August 23, 2011)

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Researchers at the National High Magnetic Field Laboratory's Pulsed Field Facility at Los Alamos National Laboratory (LANL) have set a new world record for the strongest magnetic field ever produced by a nondestructive magnet. On August 18, a record field of 92.5 T was produced, surpassing the previous record held by a team of German scientists. On August 19, the researchers surpassed their previous achievement, increasing the field strength to 97.4 T. The ability to produce extremely high magnetic fields nondestructively can be used to study the fundamental properties of a variety of materials, from metals and superconductors to semiconductors and insulators, with the interaction of high magnetic fields and the electrons in these materials providing valuable clues regarding the properties of the materials. The Pulsed Field Facility at LANL is expected to provide magnetic pulses of 95 T on a routine basis and will likely attract worldwide users.
Source:
"Los Alamos achieves world-record pulsed magnetic field"
Los Alamos National Laboratory (August 23, 2011)

Power

LS Cable & System (September 19, 2011)

LS Cable & System and the Korea Electric Power Corporation (KEPCO) have announced that together with the Korea Electro-technology Research Institute and the Korea Electric Power Research Institute, they are about to being an extensive R&D effort to implement a next-generation superconducting power transmission network project that has been initiated by the Ministry of Knowledge Economy to develop smart grid technologies by 2016. The project was initiated based on the need to develop large-capacity, high-efficiency and ecofriendly power transmission technologies using superconductor technology and to apply these technologies in actual transmission systems. The objectives of the project are to select systems for superconducting device application, to analyze such systems and develop plans for system integration, and to discover systematic support measures to enable the commercialization of the technologies and secure operation standards, maintenance procedures, and engineering techniques. Part of the project will include the development of a transmission level DC/AC superconductor cable manufacturing system and a transmission level superconducting fault current limiter.
Source:
"LSC&S and KEPCO accelerate next-generation superconducting transmission network development"
LS Cable & System press release (September 19, 2011)

Stanford University (September 22)

Stanford University's Global Climate and Energy Project (GCEP) will award US $3.5 million to researchers at five universities for the development of new technologies that could dramatically improve the energy storage capacity of the electric grid. The GCEP research initiative will focus on new approaches to developing high-efficiency electrochemical storage systems and flywheels. Twelve investigators will focus on three innovative technologies, one of which is a low-cost flywheel energy storage system. Researchers at the University of Texas will investigate two novel designs (a pendulum flywheel and a hubless flywheel) that use high-strength carbon nanomaterials with superconducting qualities to increase the energy storage capacity at a significantly reduced cost. Richard Thompson, senior engineering scientist at the University of Texas' Austin Center for Electromechanics, commented, "The GCEP award will allow us to advance the

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understanding of revolutionary flywheel designs, which have the potential for a 10-fold decrease in the cost of stored energy compared to other technologies."
The GCEP is a collaboration of scientific and engineering communities in academia and industry that is supported by ExxonMobil, General Electric, Schlumberger, and Toyota. The project was established to explore science with the potential to lead to energy technologies that are efficient, environmentally benign, and cost effective.
Source:
"GCEP awards $3.5 million for energy research"
Stanford University press release (September 22, 2011)
http://news.stanford.edu/news/2011/september/gcep-energy-awards-092311.html

American Superconductor Corporation (September 23, 2011)

American Superconductor Corporation (AMSC) has announced nearly US $100 million in new contracts in wind power and power grid markets since the start of the company's fiscal year on April 1, 2011. These contracts include deals with wind turbine manufacturers in China, India, and Korea, as well as orders for grid interconnections and high voltage stability solutions in the U.S. and Europe plus a key high-temperature superconductor wire shipment to South Korea. Specifically, AMSC has signed a new multi-year contract with JINGCHENG New Energy Co., Ltd. (Beijing, China) for the delivery of electrical control systems (ECS) for wind turbines. Shipments under this contract will begin in late calendar year 2011 and conclude in calendar year 2014. As well, a contract for wind turbine ECS has been signed with Inox Wind Limited (India); shipments will being in late calendar year 2011 and will conclude in 2012. In South Korea, AMSC has signed contracts with Hyundai Heavy Industries to provide wind turbine core electrical components within calendar year 2011. Regarding power grid applications, AMSC has signed a multi-million-dollar contract to provide a D-VAR® system for Keys Energy Services, a public power utility located in Florida. Additionally, AMSC has signed several new grid integration solution contracts for wind farms and solar power plants in both Europe and the U.S. Finally, AMSC recently made its first Amperium ™ wire shipment to LS Cable & System (South Korea) as part of a multi-year supply agreement announced in October 2010.
Source:
"AMSC Announces Nearly $100 Million in New Contracts Across Product Lines and Geographies"
American Superconductor Corporation press release (September 23, 2011)

American Superconductor Corporation (September 29, 2011)

American Superconductor Corporation (AMSC) has announced that the world's longest distribution-voltage superconductor cable system, which is capable of carrying approximately 50 MW of power, has been energized at the I'cheon substation near Seoul, South Korea. The 22.9-kV AC cable system is powered by AMSC's Amperium™ superconductor wire and has been installed in the Korea Electric Power Company (KEPCO)'s electricity grid. Yup Heo, Executive Vice President of KEPCO's construction division, commented, "The energizing of the I'cheon substation has great historical significance and demonstrates that Korean power electric technology is at a world-class level. Based on the technology and the know-how from this installation, KEPCO will continue to develop transmission voltage superconductor power cables and is securing the world's top superconductor technology and market position." LS Cable & System President Jong-ho Son added, "Beginning with helping to fulfill KEPCO's vision and expanding into a global business, we plan to capitalize on superconductor technology to meet

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the growing power demands of Korea and the world."
Source:
"First Superconductor Cable Energized in Korea's Power Grid"
American Superconductor Corporation press release (September 29, 2011)

Complaint

American Superconductor Corporation (September 14, 2011)

American Superconductor Corporation (AMSC) is filing criminal and civil complaints in China against Sinovel Wind Group Co. Ltd. (Sinovel, China), alleging the illegal use of AMSC's intellectual property. The suits follow an intensive investigation conducted by both AMSC and law enforcement officials. AMSC believes that Sinovel illegally obtained and used AMSC's intellectual property to upgrade its 1.5-MW wind turbine in the field so as to meet proposed Chinese grid codes and potentially allow the use of core electrical components from other manufacturers. AMSC is seeking a cease and desist order as well as monetary damages to compensate for economic losses resulting from the infringement. An arbitration claim has also been filed to compel Sinovel to pay AMSC for past product shipments and to accept all contracted but not yet delivered core electrical components under existing contracts. AMSC is now operating under the assumption that Sinovel will no longer be a customer.
Source:
"AMSC Filing Criminal and Civil Complaints Against Sinovel"
American Superconductor Corporation press release (September 14, 2011)

Restructuring

Zenergy Power plc (September 15, 2011)

Zenergy Power plc has announced a restructuring of its business to focus on the development and marketing of its fault current limiter (FCL) product. The company will concentrate on the development of a next-generation FCL design that is not dependent on HTS magnets, thereby enabling a significant reduction in complexity and manufacturing costs. The company has decided not to spend further capital to develop either second-generation HTS wire or its magnetic billet heater. Furthermore, no further capital will be deployed in the group's German subsidiary, Zenergy Power GmbH. The group's head count will be reduced by 70 %, with FCL operations and teams in the USA and Australia being the only to remain in place. These changes are expected to enable the operating cash burn rate to be reduced by two-thirds to £4 million per annum. The group's present cash balance is approximately £6 million.
The company noted that, "While significant progress has been made with the development of Zenergy's 2G HTS wire and magnetic billet heaters, such progress generated insufficient external interest to result in a meaningful investment, licensing or strategic collaboration with the Group. The Board concluded, therefore, that the large amount of further investment and time required to achieve full commercialization of the Group's intellectual property in these product areas is unrealistic. Consequently, no further capital will be deployed on these projects for the foreseeable future."
Source:
"Corporate Restructuring – Business Focussed on New Design FCL"

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Zenergy Power plc press release (September 15, 2011)

Basics

SLAC National Accelerator Laboratory (September 4, 2011)

Researchers at the SLAC National Accelerator Laboratory have reported a crucial milestone that could lead to a new class of materials with useful electronic properties. The researchers sandwiched two nonmagnetic insulators together and discovered that the layer where the two materials meet has both magnetic and superconducting regions even though these two properties cannot normally coexist. Known as complex oxides, these materials are regarded to be a first step in the development of a potential new form of computing memory for storage and processing. Determining whether the coexistence of the superconductivity and magnetism marks the discovery of an exotic new form of superconductivity that actively interacts with magnetism will be a critical next step in further research. In an independent report published simultaneously by researchers at the Massachusetts Institute of Technology, the existence of magnetism at the interface of the materials was confirmed using an alternative means of measurement. The group's work was reported in Nature Physics.

Source:

"Novel magnetic, superconducting material opens new possibilities in electronics"

SLAC National Accelerator Laboratory press release (September 4, 2011)

https://news.slac.stanford.edu/press-release/novel-magnetic-superconducting-material-opens-new-possibilities-electronics

CNRS (September 8, 2011)

Researchers at the CNRS Laboratoire National des Champs Magnétiques Intenses have demonstrated the alignment of a high-temperature superconductor into linear filaments after destabilizing the material's superconductivity using a strong magnetic field. The researchers subjected samples of YBaCuO to a strong magnetic field and then used nuclear magnetic resonance to probe the superconductor at the atomic scale. They discovered that under intense magnetic fields, the material's electrons tend to align into rectilinear filaments or "stripes". Such alignment as only been previously observed in non-superconducting or weakly superconducting materials. The present findings suggest that a strong magnetic field must weaken the superconductivity for this effect to be observed. Whether this new observation has any relation to the superconductivity mechanism, however, remains unclear. The group's work was published in Nature.

Source:

"Superconductivity: the puzzle is taking shape!"

CNRS press release (September 8, 2011)

http://www2.cnrs.fr/en/1901.htm

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