T_cSUH Special Seminar

Texas Center for Superconductivity at the University of Houston

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"High-Temperature Superconducting Wire and Power Applications Research and Development in the USA"

Friday, November 11, 2005
Room 102, University of Houston Science Center
12:00 Noon – 1:00 p.m.

Abstract

U.S. efforts to develop and deploy "second generation" (2G) high-temperature superconducting (HTS) wires that use the compound $Y_1Ba_2Cu_3O_x$ (YBCO) or other rare-earth (RE) superconducting materials are described. Wires have been demonstrated in 20-m to >200-m lengths with the RE-BCO deposited using vapor deposition or wet chemical processes in thin layers onto textured templates, which force the grains of the RE-BCO into near perfect alignment. Critical currents for these pre-commercial wires are now within striking distance of those achieved for commercial BSSCO wires. One expected advantage of 2G wire is a projected 5-fold decrease in cost of wire compared with first generation wires. Another advantage of 2G wire is the intrinsic behavior of YBCO in the presence of a strong magnetic field at intermediate temperatures (viz., 50 K), where single-stage cryocoolers may be used for certain applications. Enhancements in flux pinning of at least a factor of two have been demonstrated for MOCVD and MOD deposited YBCO films. U.S. progress towards meeting the challenging goals for the year 2006, including current exceeding 300 A/cm width (77 K, self field) in 100-m lengths and engineering current density exceeding 15,000 A/cm^2 (65 K, 3-T) is reported. In addition, initial efforts toward engineering the conductor for the mechanical and electrical properties needed for strong magnetic field applications are described. These projects include striation or other means to subdivide the superconducting film into filaments, as well as lamination or other innovative processes. Finally, an overview of U.S. demonstration projects for superconducting cables, synchronous condensers, motors, generators, and other power applications will be presented.

Robert A. (Bob) Hawsey is manager of Electric Transmission and Distribution Technologies at the U.S. Department of Energy's Oak Ridge National Laboratory (ORNL) in Tennessee. He is responsible for program leadership, technical and business management and program development for ORNL's research and development projects conducted for the Office of Electricity Delivery and Energy Reliability. The diverse R&D portfolio includes high-temperature superconductivity materials and electric power systems; transmission reliability; power electronics, sensors, and controls for high-voltage applications; electricity storage; and the integration of this equipment into the transmission and distribution grid. Prior to coming to Oak Ridge in 1980, Mr. Hawsey was a development engineer for the AiResearch Manufacturing Company in Los Angeles where he designed and conducted experiments for high speed rotating machinery. He holds the B.S.-Ed. degree in Physics-Mathematics (Indiana University of Pennsylvania) and the M.S. in Engineering Physics (University of Virginia). Mr. Hawsey is a member of the IEEE and previously served as president of the Oak Ridge Section of ASME-International. He has served on an Industrial Advisory Board for Embry-Riddle Aeronautical University in Florida. He holds three U.S. patents and is co-chairperson of the program committee for the 18th International Symposium on Superconductivity.

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