T_CSUH Special Seminar

Texas Center for Superconductivity at the University of Houston

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"YBCO and MgB_2 Conductors for ac and Space Applications"

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Room 102, University of Houston Science Center
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Abstract

Advances in multifilamentary $YBa_2Cu_3O_7$ coated conductor technology such as mechanical patterning, laser grooving, and ink-jet patterning may allow the manufacture of ac conductors with narrow filaments on a thin non-magnetic metal alloy or flexible ceramic substrate which is separated from the superconductor by thin dielectric, conductive, or even magnetic buffers. The role of percolative paths in bridged patterned conductors is discussed. It was found that ac losses of striated samples with multiple bridges are higher than those of the samples with no bridges due to significant filament coupling, but, even so, the losses are still substantially lower than those of a monolayer sample. The possibility of using ink-jet printing technology in the manufacture of complex 3D superconducting structures is assessed. The Adiabatic Demagnetisation Refrigerator (ADR) is the preferred technology for cooling cryogenic detectors for space applications. MgB_2 has excellent potential for these applications, and an ADR with MgB_2 magnet coils is in development to meet the requirements of the European Space Agency's XEUS project. These include the production of 3 T at 15–20 K with current not exceeding 15 A, placing considerable demands on MgB_2 powder-in-tube conductor technology. Practical options for wire design, matrix material, starting powders, dopants, and thermo-mechanical processing are quantitatively reviewed, and experimental results presented, to support design proposals for these conductors. Some numerical results on critical currents and thermal stability of the future MgB_2 multifilamentary coated conductors with magnetic cladding of their filaments are presented and discussed.

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