

New Superconductors for Fusion Magnets

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All fusion magnets until now have been made from Nb-Ti, Nb₃Sn or occasionally Nb₃Al. In 2003 several very important milestones in superconducting magnet technology occurred – a 16 Tesla dipole using advanced, very high current density Nb₃Sn was made at LBNL and a 25 Tesla small bore Bi-2212 solenoid was made at the NHMFL. Superconducting materials made major advances too. Bi-2223, the only industrially available cuprate high temperature superconductor, was optimized to new high values of current density, while coated conductors of YBCO were first made by multiple continuous processes, leaving hope that cheap, Ag-free conductors will be soon industrially available. In 2003 too it was shown that MgB₂ could be alloyed to produce critical fields of over 40 Tesla, thus convincingly exceeding the critical field properties of any Nb-base superconductor. This talk will address the future technology promise of new superconductors, taking advanced Nb₃Sn, the present choice for fusion magnets, as their benchmark.