

Superconductors in High Magnetic Fields – Now and the Future

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Abstract – A development of high field superconducting magnet requires both a high in-field critical current density J_c and a high mechanical strength. Most practical superconducting materials like Nb_3Sn , $Bi_2Sr_2Ca_1Cu_2O_y$ (Bi2212), $Bi_2Sr_2Ca_2Cu_3O_y$ (Bi2223) and $REBa_2Cu_3O_y$ (RE123, RE: rare earth and yttrium), except NbTi, are brittle and hence are weak against mechanical stress. Therefore, the reinforcement as well as the improvement of the in-field J_c are necessary for high field magnet applications. The in-field J_c can be improved by the introduction of strong flux pinning centers. The high strength superconducting wires and tapes have been developed by the reinforcement with a high strength material. Those novel approaches are used successfully for some practical superconducting wires. In the presentation, the flux pinning and the mechanical stress/strain properties on the advanced practical superconducting materials will be introduced and discussed for high magnetic field applications.

Keywords (Index Terms) – Practical superconductors, high magnetic fields, critical current density, mechanical properties.

IEEE-CSC & ESAS SUPERCONDUCTIVITY NEWS FORUM (global edition), November 2019.

Received September 12, 2019; selected September 20, 2019. Reference RP107; Category 5, 6.

Plenary presentation 3-MO-PL2 given at EUCAS, 01 - 05 September 2019, Glasgow (UK).