IEEE-CSC, ESAS and CSSJ SUPERCONDUCTIVITY NEWS FORUM (global edition), Issue No. 57, Oct 2024

The Continuing Utility and Potential of Nb-based Superconducting Composite

Mike Sumption

MSE, Ohio State University, Columbus, Ohio, USA

E-mail: sumption.3@osu.edu

***Abstract*–Exciting developments continue to go on for HTS conductors and cables, including those based on ReBCO, Bi:2212 and 2223, MgB_2, and the pnictides. On the other hand, Nb-based superconductors, including NbTi, Nb_3Sn, Nb_3Al, continue in their utility and have continuing potential. NbTi conductors, are in fact the backbone of commercial superconducting technologies, with MRI (and NMR) an outstanding example of commercial success, and various particle accelerators their technological success. These conductors will continue to be used wherever and whenever they can be, because they are cost effective, mature, and convenient (except for the cooling!), Nb3Sn conductors, continue to have potential for the next generation of accelerator magnets as the most cost effective and practical solution for achieving the needed performance, and even if supplemented by HTS inserts, they will be crucial aspects of the machine, keeping them viable both technically and cost-wise. Recent advances in these conductors are quite exciting and performance continues to increase for this well-known conductor. Nb_3Sn as well as Nb_3Al may still have a role to play in fusion. While great excitement has developed over compact fusion reactors, the future fusion reactors will need to be commercially as well as technically viable, and Nb_3Sn and Nb_3Al are of interest for hybrid and cost-effective magnets. LTSC conductor, especially those based on Nb, will continue to be of interest for machine and application development for some time to come.**

Keywords (Index Terms)– Nb3Sn, Nb3Al, vortex pinning, artificial pinning centers, grain boundaries, internal oxidation

IEEE-CSC, ESAS and CSSJ SUPERCONDUCTIVITY NEWS FORUM (global edition), Issue No. 57, Oct 2024. Presentation given at ASC 2024, Sept 2024, Salt Lake City, Utah, USA.