



Contribution ID: 408

Type: **Poster Presentation**

Quench induced critical current degradation in REBCO coated conductor and Bi2223 tape

Monday 29 June 2015 09:00 (2 hours)

One of the remaining challenges for high temperature superconducting magnets is quench protection. To develop an effective quench protection system, it is important to understand the conditions that must be avoided during a quench so that the conductor is not degraded. Our previous study on Ag/Bi2212 round wires has shown that the quench degradation is a strain-driven effect and strongly depends on the hotspot temperature, T_{quench} , during the quench; critical current I_{c} of Bi-2212 wires gradually degraded irreversibly when T_{quench} exceeds 350-500 K, above which I_{c} of Bi-2212 dropped quickly to zero. Here, similar quench experiments are performed on commercial REBCO coated conductors from Superpower and CT-OP Bi2223 tapes from Sumitomo. REBCO coated conductor has a Hastelloy substrate whereas Bi-2223 tapes include bare tapes, tapes reinforced with stainless steel and Ni-Cr. The dependence of their I_{c} on T_{quench} will be determined for various test setups, for example with or without epoxy impregnation. Microstructure of the degraded samples will be investigated using optical and electron microscopy to further reveal the degradation mechanism at microscopic level.

This work is supported by the U.S. Department of Energy, Office of High Energy Physics through a FY12 early career award.

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Session Classification: M1PoA - Superconducting Materials and Applications

Track Classification: ICMC-08 - Superconductor Stability and AC Losses