2G HTS Coil Technology Development at SuperPower

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Abstract - The second-generation high temperature superconductor (2G HTS), Re-Ba-Cu-O coated conductors are known for strong mechanical properties and have numerous potential applications in high magnetic field research and electrical power systems. It has been noted in the community that coated conductors can be prone to performance degradation on thermal cycling when used in epoxy impregnated magnet windings. This degradation has been tied to the c-axis peel strength in the wire. SuperPower is addressing this issue with a short-term approach of developing novel technologies in conductor post processing and coil winding technology which allows building high quality coils with current generation conductor, and a longer-term approach of improving wire production to build stronger wire with high c-axis peel strength.

This paper will focus on the first, short-term development work. SuperPower has learned from reported techniques in 2G HTS coil winding and built on them to demonstrate coil winding technology to fabricate high quality 2G HTS coils. Multiple double pancake coils (DPCs) were successfully wound employing a thin release layer, stainless-steel co-winding with a partial epoxy impregnation technique. The DPCs are slow cooled under multiple thermal cycles to 77 K and tested for critical current. Repeatable test results of expected Ic and good n value indicate that techniques employed are able to use current generation conductor. We also briefly review a few key factors related to 2G HTS magnets including in-coil splice resistance, layer wound magnet development and alternative insulation.

Keywords - 2G HTS, Superconducting coil, C-axis peel strength, Coil winding.

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