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M1Po2C-02 [37]: High Speed Spin Test of Reinforced 2212 Superconductor

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This paper summarizes the latest developments in some on-going research at the Wentworth Institute of Technology to qualify a new reinforced-2212 superconductor, being developed by Solid Materials Solutions in Chelmsford, MA, for use in high magnetic fields. Under an NIH-funded grant, we are developing a high-speed spin test which will impose circumferential hoop stresses on the 2212 windings at a level (~700 Mpa) equivalent to that experienced at 30 T field levels. In year 2 of this project, we have designed and built a mandrel that can hold the wire and spin at high speeds (100,000+ rpm). By spinning coils wound on a 60-mm diameter mandrel at a speed of 100,000 rpm, the hoop stress is ~700 MPa, which is sufficient to exceed the yield strength of the reinforced Bi-2212 conductor. We will be working with Barbour Stockwell Incorporation (BSI) in Woburn, Ma to manufacture our mandrel and help complete stress testing as we do not have adequate equipment here at our school. Our proposed design includes a thin-walled mandrel with exterior threads and a top flange piece to connect the mandrel to the BSI's machine spindle which connects to their spin test chamber. The superconducting wire sits on the exterior threads of the mandrel where it was epoxy-bonded into the mandrel. This design will allow the stress to be equally distributed circumferentially within the area of the wire. This paper presents the initial results of the spin testing which was performed at ~100 K. After each spin test, the critical current of the coil was measured at solid nitrogen temperature (63 K) in order to inspect for mechanical degradation.

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