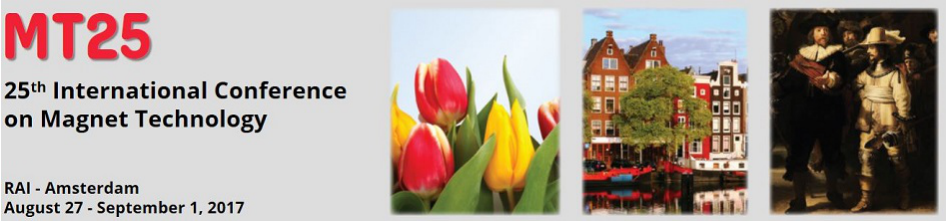

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Bending-peeling method to measure interface strength of YBCO tape

Thursday, 31 August 2017 13:45 (1h 45m)

YBCO superconductor tape adopts a laminated structure wrapped up with Cu stabilizer. This structure helps control the orientation of YBCO and realize a high critical current. Moreover, it cn endure high tensile strain of 0.5% without apparent degradation in superconductivity. However, the interface between the laminas is quite weak. Winded tape coil impregnated with resin often suffers from lamination due to thermal mismatch during cooling down from room temperature to working temperature. Therefore it is necessary to study the strength and crack characteristics of the weakest interface in the tape, and how the crack happens during cooling. We designed a new experiment to analyze the interface strength of YBCO tape. A piece of tape is first embedded in a rectangular section beam of epoxy resin, with tape plane parallel to the beam's middle cross section, tape edge at beam surface. The epoxy beam height is bigger than the tape width. Three-point bending is applied to the beam, one point on the opposite side of the tape across the beam and other two points at the two ends. So the interface is tensed during loading. In this way, the interface strength can be determined directly, and the interface energy can be calculated through the force-displacement curve. The crack interface is observed using SEM, and analyzed with EDS technique. The average interface strength is 5.16 MPa. The experiment data is used to further simulate the crack behaviour during the cooling down process. This method is convenient for measuring commercially available tape, and avoids soldering which is usually adopted for interface strength measurement but exposes the tape to the influence of heat.

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