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Wed-Af-Po.04-03: Aging effects in (RE)B₂C₃O₇-d tapes solder joints made with indium-tin

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Rare-Earth Barium Copper Oxide (REBCO)-based High-Temperature Superconductor (HTS) tapes are used for large-scale applications, which typically require spools longer than those currently produced. Therefore, several joints are often needed for a single project, emphasizing the importance of low-resistivity, mechanically strong, and repeatable joints. Currently, soldering is one of the most common method used, however, aging effects such as diffusion and oxidation are known to occur with the solders typically used. No studies have yet been conducted on this phenomenon to our knowledge for REBCO tape solder joints.

This study examines the changes in the properties of REBCO tape solder joints made with eutectic indium-tin solder over time. One suspected aging effect is the intermetallic compound (IMC) growth at the copper layer and solder interface. Since IMC growth is relatively slow at room temperature, heat treatment at 100°C is used to accelerate the process and observe its consequences. The IMC growth is expected to have an impact on the joints resistivity, and in extreme cases where the solder diffuses up to the REBCO layer, an impact on the critical current.

Finally, storage at room temperature in a desiccator is a common practice, especially for test coils; therefore, the changes in joint properties over time due to oxidation in the desiccator are also studied. All resistivity and critical current measurements are conducted in a liquid nitrogen bath using the four-probe method.

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