Contribution ID: **958** Type: **Contributed Oral Presentation**

M2Or1A-02: Variation in strain sensitivity and microstructure as a function of overpressure processing conditions for Ag-sheathed Bi-2212 round wire

Tuesday 23 July 2019 09:45 (15 minutes)

Significant increases in the current-carrying capacity (Ic) of Ag-sheathed Bi-2212 over the past several years has made this material a viable candidate for high-field magnets. However, the management of Ic degradation as a function of applied strain remains a challenge, as does the implementation of overpressure processing (OP) heat-treatment conditions for magnets. In this study, we investigated the strain sensitivity and microstructural bases for Ic degradation as a function of OP processing conditions for a Bruker OST strand. We have shown that higher OP pressures correlate with increased strain sensitivity in axial compression, a wider plateau of limited degradation in axial tension, and a steeper degradation in tension after the plateau. The compressive behavior can be understood in terms of the more consolidated filament structure at high OP pressures providing material continuums for longer crack-propagation paths, while in tension the reduced intrafilament surface area at high OP pressures limits the availability of sites for crack initiation. We discuss the implications of these results for both magnet and composite wire design.

Acknowledgements: This work was financially supported by the U.S. Department of Energy, Office of High Energy Physics, Grants DE-FG02-13ER42036, DE-SC0010690, and DE-SC0017657, and benefited from the Materials Science & Engineering Center at UW-Eau Claire. The work at the NHMFL is supported by the US DOE Office of High Energy Physics under grant number DE-SC0010421, by the National Institute of General Medical Sciences of the NIH under Award Number R21GM111302, and by the NHMFL, which is supported by NSF under Award Numbers DMR-1157490 and DMR-1644779, and by the State of Florida, and is amplified by the U.S. Magnet Development Program (MDP).

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Session Classification: M2Or1A - BSCCO - Conductors