Split Processing of High Superconductor Fraction $\text{Bi}_2\text{Sr}_2\text{Ca}_x\text{Cu}_2\text{O}_y/\text{AgMg}$ Round Wire

X.T. Liu (NHMFL), T.M. Shen(NHMFL), U.P. Trociewitz (NHMFL), W. Nachtrab (Supercon), T.Wong (Supercon), J. Schwartz (NHMFL & CoE, FSU)

Introduction
Silver-alloy sheathed $\text{Bi}_2\text{Sr}_2\text{Ca}_1\text{Cu}_2\text{O}_x$ (Bi2212) superconductor is one of the most promising materials for high field magnet applications. Split processing provides the heat treatment window for RWS magnet manufacturing to avoid the primary issues that limit W&R and R&W technology.

Experimental
High superconductor fraction Bi2212/AgMg round wire produced by single-restack technology was used. After optimization, the standard process was interrupted at different temperatures and the processing parameters were optimized. The transport properties were measured using the four-probe method. The superconductive transition was measured in the SQUID. The microstructures were examined by SEM and EDS.

Results and Discussion

![Fig. 1 Effect of $T_1$ on $J_c$ during standard process and split process](image1)

Fig. 1 shows the effect of $T_1$ on $J_c$ after standard process and split process. For both standard and split process, $J_c$ is highest at $T_1=T_p-7°C$ and $J_c$ is increased by ~40% after split processing. With the increasing of $T_1$, the $J_c$ decrease for both processes. However, with the decreasing of $T_1$, $J_c$ decrease greatly after split process compared to those after standard process, indicating that the transport properties of the samples after split temperature is more sensitive to $T_1$ that those of standard process.

![Fig. 2 Effect of split temperature on $J_c$ during split process](image2)

Fig. 2 shows the split temperature on $J_c$ during split process. There exists a “no go” window of critical current during split process, indicating that the standard process have to be split before 877.6°C or after 867.6°C when the reheating temperature returns to the split temperature ($T_r=T_s$).

![Fig. 3 Effect of $T_1$ on $J_c$ and n-value during split process](image3)

Fig.3 shows the effect of reheating temperature on $J_c$ when the standard process was interrupted at $T_1$. It was shown $J_c$ is sensitive to reheating temperature and the lower reheating temperature lead to very low performance, which supports the results in Fig. 2 that lower split temperature corresponding to lower reheating temperature in the “no go” window in case of $T_r=T_s$.

Conclusions
Effect of $T_1$ show different tendency during standard and split process; during split process, the reheating temperature is important to obtain high performance. With the interruption at different temperature, there exist a “no go” window of critical current during split process, which indicate that low reheating temperature leads to low performance due to low split temperature($T_r=T_s$).

Acknowledgements
This work was supported by the National Institutes for Health through a Phase II STTR, subcontracted from Supercon, Inc.

References