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# Enhancement of Critical Current Density of Liquid Infiltration Processed Y-Ba-Cu-O Bulk Superconductors Used for Flywheel Energy Storage System

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**Abstract :** The size effects of a precursor Y2BaCuO5 (Y211) powder on the microstructure and critical current density (Jc) of liquid infiltration growth (LIG)-processed YBa2Cu3O7-y (Y123) bulk superconductors were investigated in terms of milling time (t). YBCO bulk samples having high Jc values have been selected for the flywheel energy storage system. Y211 powders were attrition-milled for 0-10 h in 2 h increments at a fixed rotation speed of 400 RPM. Y211 pre-forms were made by pelletizing the milled Y211 powders followed by subsequent sintering, after which an LIG process with top seeding was applied to the Y211/Ba3Cu5O8 (Y035) pre-forms. Spherical pores were observed in all LIG-processed Y123 samples, and the pore density gradually decreased as t increased from 0 h to 8 h. In addition to the reduced pore density, the Y211 particle size in the final Y123 products also decreased with increasing t. As t increased further to 10 h, unexpected Y211 coarsening and large pore evolutions were observed. The magnetic susceptibility-temperature curves showed that the onset superconducting transition temperature (Tc, onset) of all samples was the same (91.5 K), but the transition width became greater as t increased. The Jc of the Y123 bulk superconductors fabricated in this study was observed to correlate well with t of the Y211 precursor powder. The maximum Jc of 1.0×105 A cm-2 (at 77 K, 0 T) was achieved at t = 8 h, which is attributed to the reduction in pore density and Y211 particle size. The prolonged milling time of t = 10 h decreased the Jc of the LIG-processed Y123 superconductor owing to the evolution of large pores and exaggerated Y211 growth. YBCO bulk samples having high Jc (samples prepared using 8 h milled powders) have been used for the energy storage system in flywheel energy storage system.

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