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Thu-Mo-Po4.05-01 [31]: New precursor powders fabrication technique for Bi-2223 high temperature superconducting tapes

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Nowadays, although the fabrication techniques of high temperature superconductors have been far developed, Bi2Sr2Ca2Cu3O10 (Bi-2223) high temperature superconducting tapes are still the ones the most mature fabrication technique and the most stable batch production ability, not to mention their stable mechanical configuration. Therefore, for the construction of many big scientific facilities, including cables, and magnets with different design and target fields, Bi-2223 tapes are still considered to be the first candidate. However, aiming at building the magnet with large shimming area, the uniformity of Bi-2223 tapes has to be further improved. Due to the intrinsic drawbacks of the present fabrication techniques for Bi-2223 precursor powders, such as co-precipitation process and spray pyrolysis process, it is very difficult to obtain powder with highly uniformed chemical composition as well as particle size distribution. Therefore, in our study, a new technique, named frozen drying process has been adopted for the fabrication of Bi-2223 precursor powders. Based on the obtained results, with this frozen drying process and properly optimized fabrication parameters, precursor powders with exact chemical composition as nominal values, high uniformity of chemical composition, narrow particle size distribution and low carbon content have been achieved. By optimizing the calcination temperatures, it was noticed that due to the decrease of particle size, the optimal sintering temperature decreased obviously, comparing with the co-precipitated powders. At last, multifilament tapes were fabricated with frozen dried powders, and the critical current of ˜100 A were obtained by optimizing the sintering process of Bi-2223 tapes. The uniformity of obtained tapes has also been proved to be effectively improved, which should be beneficial to the fabrication of magnets.

Authors: Dr ZHANG, Shengnan (Northwest Institute for Non-ferrous Metal Research); Dr JIN, Lihua (Northwest Institute for Non-ferrous Metal Research); Mr HUANG, Yingjian (Northwest Institute for Non-ferrous Metal Research); Mr LI, Chengshan (Northwest Institute for Nonferrous Metal Research); Prof. FENG, jianqing (Northwest Institute for Non-ferrous Metal Research); Prof. YU, Zeming (Northwest Institute for Non-ferrous Metal Research); Mr MA, Xiaobo (Northwest Institute for Non-ferrous Metal Research); Prof. ZHANG, Pingxiang (Northwest Institute for Non-ferrous Metal Research)

Presenter: Mr LI, Chengshan (Northwest Institute for Nonferrous Metal Research)

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