

## WBP3-4

### Development of Bi-2223 high temperature superconducting tapes in NIN

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Bi-2223 high temperature superconducting tapes are called the First generation High temperature Superconductors (HTS) based on their sophisticated fabrication technique and stable mechanical structures. So far, there have already been many demonstration projects successfully proved the reliability of Bi-2223 HTS tapes. Therefore, the development of the fabrication technique is very important for the further improvement of superconducting related techniques. Northwest Institute for Non-Ferrous Metal Research (NIN) started the study of Bi-2223 tapes since 1990s. Recently, new improvements based on the novel spray pyrolysis techniques for precursor powders fabrication, the introduction of groove rolling process into cold working process, as well as the investigation and optimization of rolling process have been achieved and the current capacity of Bi-2223 tapes has been enhanced. Comparing with the traditional coprecipitation process we adopted for nearly 20 years, the spray pyrolysis technique exhibits many advantages, such as high uniformity of particle size and chemical composition, large production capability and short process path, which can all be beneficial to the industrial fabrication of precursor powders. So with the optimization of many important parameters, including pyrolysis temperature, airflow rate, and concentration of precursor solution, the critical current  $I_c$  of Bi-2223 tapes with spray pyrolysis powders has been improved from 80 A to 110 A. On the other hand, groove rolling process has completely different deformation mechanism with traditional drawing process, which is beneficial to the enhancement of filament density, and the uniform deformation of wires. Therefore, by introducing groove rolling process to replace certain steps of drawing process, the filament density has been improved for nearly 10%, and the enhancement of critical current for nearly 20% has been obtained. Finally, the optimization of rolling parameters, for example starting wire diameter and rolling passes have both been completed. And with the enhancement of filament texture, the current capacity of obtained tapes has been further enhanced. The maximum engineering critical current density  $J_e$  of 10 kA/cm<sup>2</sup> has been obtained with the heat treatment performed under ambient pressure.

Keywords: Bi-2223, High temperature superconductor, Precursor powder, Groove rolling