

# Overview of R&D Status for Coated Conductors

Teruo IZUMI

*International Superconductivity Technology Center & Industrial Superconductivity Technology Research Association*

*KSP R&D Wing A-9F, 3-2-1 Sakado, Takatsu-ku, Kawasaki-shi, Kanagawa, 213-0012 Japan*

*Tel. +81-44-850-1615, Fax +81-44-850-1613 and izumi@istec.or.jp*

Since the discovery of high  $T_c$  superconductors, lots of efforts for realizing long tape with high performance have been made in the world. Especially, the REBCO coated conductor (CC) has been expected due to its high potentials such as low future cost, high in-field performance, high mechanical strength, low ac loss etc. In this presentation, the history and current status of R&D for CC in the world are reviewed.

In the early stage of R&D for CC, long tapes with high  $I_c$  values had been aimed by many methods. The development of CC had been promoted by the competition between US and Japan by using  $I_c \times L$  value as an index. Fujikura Ltd. reported the large  $I_c \times L$  value of 467kAm (572A/cm-w, 816m) by IBAD/PLD tape at the beginning of 2011, and then this result had been the highest value for some time. During the period, SuNAM Co., Ltd. had drastically progressed and reached the second place by RCE-DR/IBAD tape. The trend of the R&D was moved to the effort for satisfying the special requirements from the applications such as in-field performance and ac loss etc. However, some movements of the  $I_c \times L$  competition have been confirmed even now. One progress is the progress in  $I_c$  uniformity as well as the length. Fujikura and SuNAM reported 1km long tapes with uniform and high  $I_c$  values over 550A/cm-w@77K&s.f. These results were realized by the efforts for the improvement of the stability of the fabrication processes. The other movement is the rising of new groups such as SuperOX and Shanghai J. T. Univ. etc.

On the other hand, the remarkable progresses in the recent trend have been also achieved. Especially for higher in-field performance, many groups have reported in the world such as the APC (artificial pinning centers) introduction technology. ISTECC found that a new combination of EuBCO and BaHfO<sub>3</sub> is more effective than the previous one of GdBCO and BaZrO<sub>3</sub>. As a typical value, high in-field  $I_c$  values of 141A/cm-w@77K&3T and 616A/cm-w@65K&3T were reported. SuperPower has shown the success in the high concentration of Zr addition into GdBCO films by MOCVD. Consequently, a high in-field  $I_c$  value of 1384A/cm-w@30K&3T, which is equivalent to the lifting factor of 4.4, was achieved. Additionally, the similar progresses were also achieved in TFA-MOD process. ISTECC and SWCC developed an effective heating pattern to obtain well dispersed fine BZO particles, which is called "interim heat treatment". AMSC reported new process to introduced effective pinning centers into MOD films, too.

Further progresses including those in the other topics will also be reviewed.