Fine Grained Nb for Internal TIN Nb_3Sn Conductors

S.Balachandran[1], R.E.Barber[2], Y. Huang[3],
H.Miao[3], J.A. Parrell[3], S. Hong[3], R.B. Griffin[4], K.T.Hartwig[1]

[1] Department of Mechanical Engineering,
Texas A&M University, College Station TX 77843-3123, USA.
[2] ShearForm Inc, Bryan TX 77801,USA
[3] Oxford Superconducting Technology, Carteret, NJ 07008,USA. .
[4] Department of Mechanical Engineering, Texas A&M University, Qatar

Abstract - The push to drive superconductor strand technology to reach higher critical current density (J_c) values and reduce production costs has led to innovative approaches in manufacturing technology. The Restacked Rod Process (RRP®) by Oxford Instruments is one such process which involves Nb bar extrusions in a Cu sheath. Commercially available Nb used in the initial RRP extrusion leads to nonuniform deformations of the Nb bar which in turn leads to a jagged Cu-Nb interface. This report presents a feasible methodology to remedy the problem of nonuniform deformation of Nb through severe plastic deformation (SPD) of precursor Nb to obtain smaller grains in starting Nb. Cu-Nb monocore extrusion and drawing experiments were accomplished at Oxford Instruments using Nb bars with grain sizes in the range of μm to mm. Results of Cu-Nb interface roughness measurements show that a finer starting grain size gives a significantly lower roughness and better Nb core conformance to initial shape. Our experiments indicate that refinement of the initial Nb grain size to below ~50μm could enable fabrication of RRP conductor with improved wire yield and higher J_c.

Keywords - Cu-Nb, fine grain Nb, high J_c, RRP, ECAE, SPD, interface roughness.

IEEE/CSC & ESAS EUROPEAN SUPERCONDUCTIVITY NEWS FORUM (ESNF), No. 10, October 2009.
Published in *AIP Conference Proceedings* 1219, pp. 216-223 (2010)