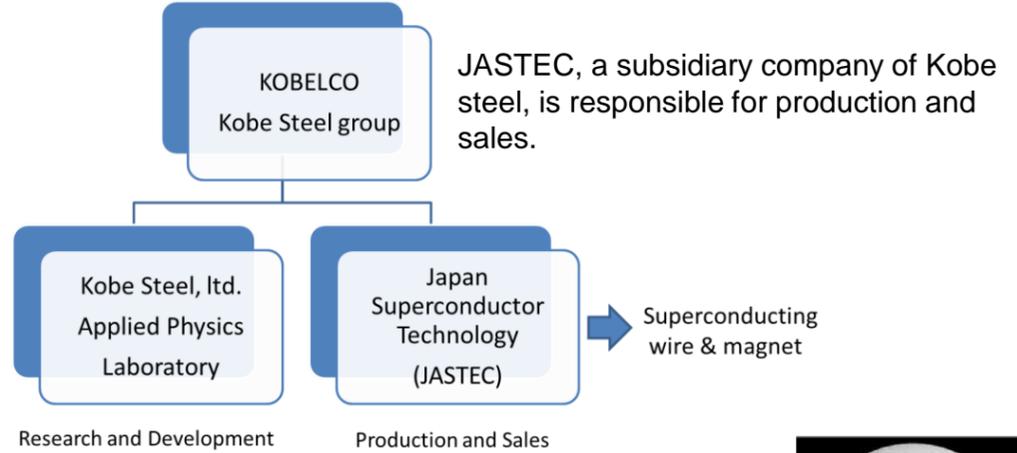


Development of Distributed Tin processed Nb₃Sn wire for FCC

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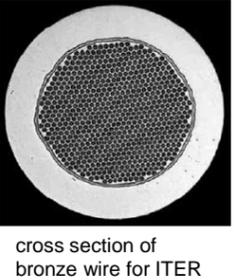
Introduction

@ Kobe Steel and JASTEC



@ Wire products of JASTEC

• Wire type : NbTi, Nb₃Sn
 Application : NMR, MRI, Accelerator
 Topics : ITER Wire



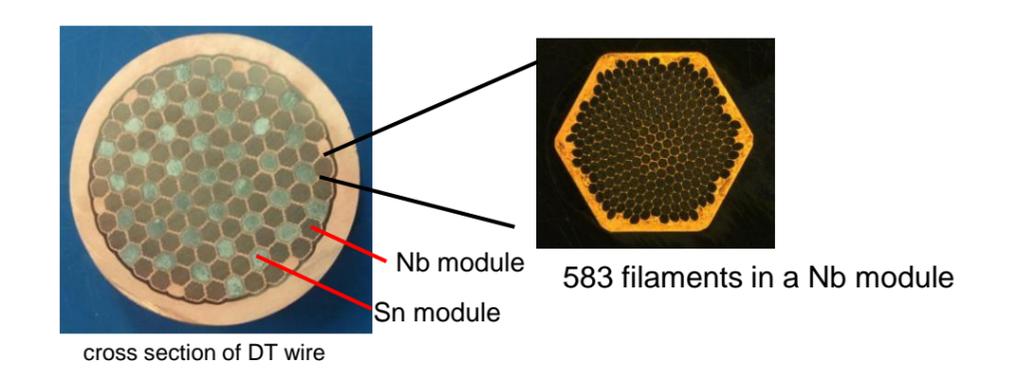
• **JASTEC is a world leading supplier of ITER Nb₃Sn strand!**
 - 40 tons for TF conductor (40% of JAPAN contribution)
 - 60 tons for CS conductor (43% of total procurement)

Development for FCC wire in KSL/JASTEC

@ Distributed Tin (DT) processed Nb₃Sn wire

We are developing the DT process, with **higher Sn concentration**.

⇒ Bronze process : < 16 wt %Sn, **DT process : 37.3 wt %Sn**



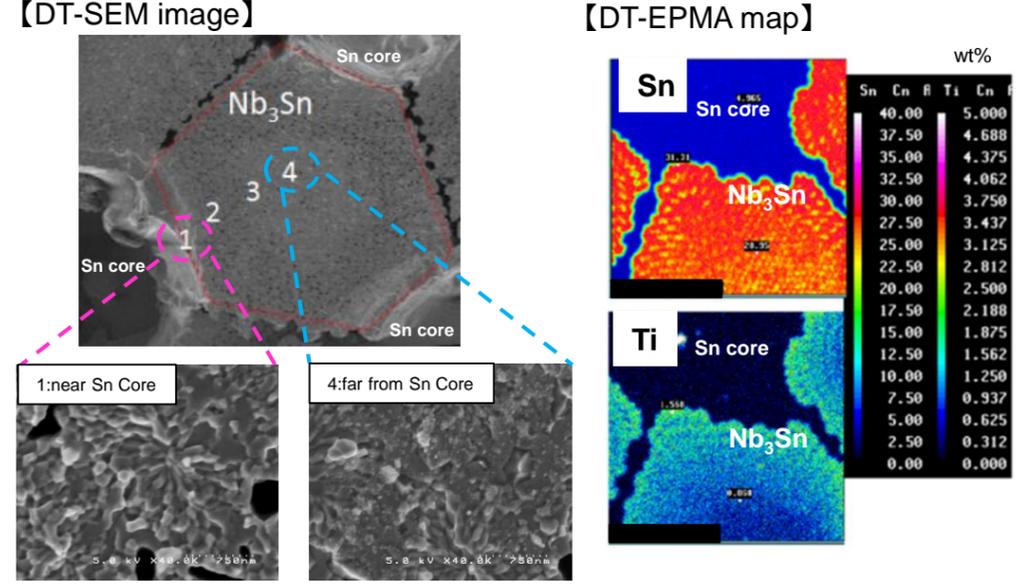
Specification	
wire diameter [mm]	0.8~1.5
Cu ratio	0.34
n value	> 30
RRR	> 100
non Cu Jc [A/mm ²]	1900@12T 800@16T
over all Jc [A/mm ²]	1400@12T 600@16T

@ Key factors for higher Jc

- (1) Improvement of Sn diffusion : Reduction of Sn diffusion distance
- (2) Increase Nb volume fraction: Reduce useless volume
- (3) Ternary additive elements : Amount and method
- (4) Optimization of heat treatment : Stoichiometry, Refinement

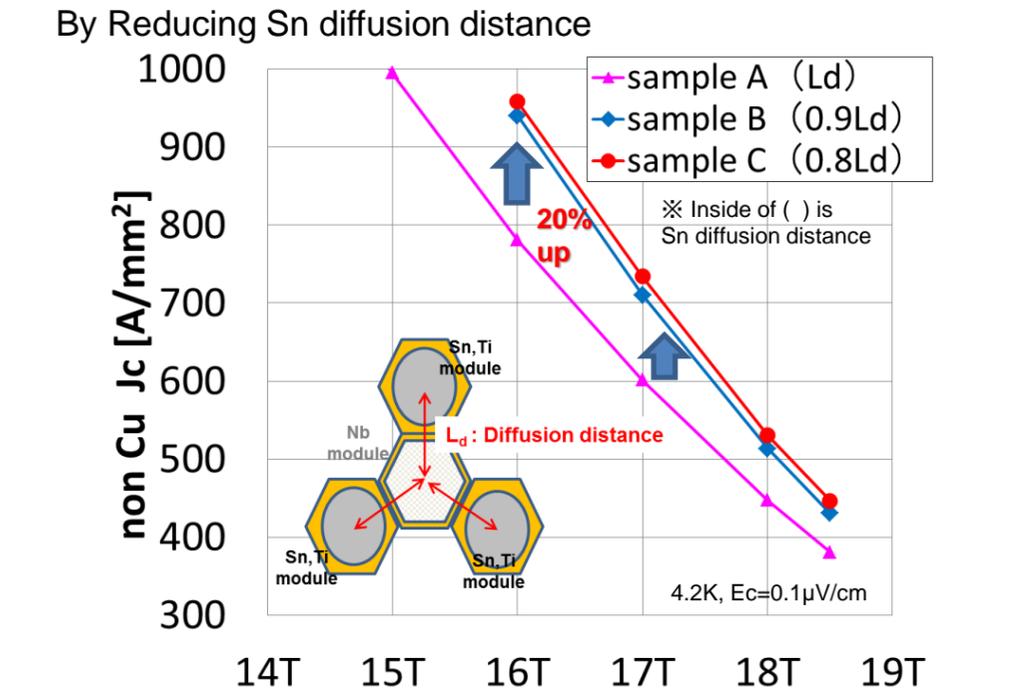
Test and results

@ Analysis of present DT wire after Heat Treatment

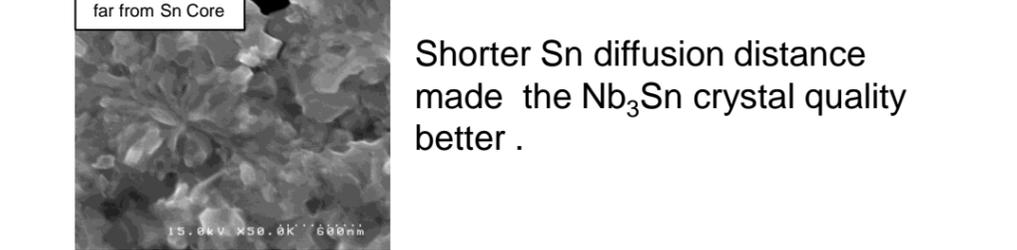


• Near the center of Nb module, the number of fine crystal grains decrease. Also the distribution of Ti and Sn seems poor.

@ Improvement of Sn diffusion



【 DT-SEM image of shorter Sn distance sample】



Conclusion and Next steps

<Conclusion>
 • DT wire as a high Jc Nb₃Sn wire for FCC.
 • By improving Sn diffusion, non Cu Jc@16T is almost 1000A/mm².

<Next steps>
 • By increasing Nb volume fraction , **non Cu Jc>1100A/mm² @16T was a prospect.**
 • Furthermore, we will perform optimization of ternary additive elements and refinement of Nb₃Sn grain size etc., Our goal is 1500 A/mm² @16T.