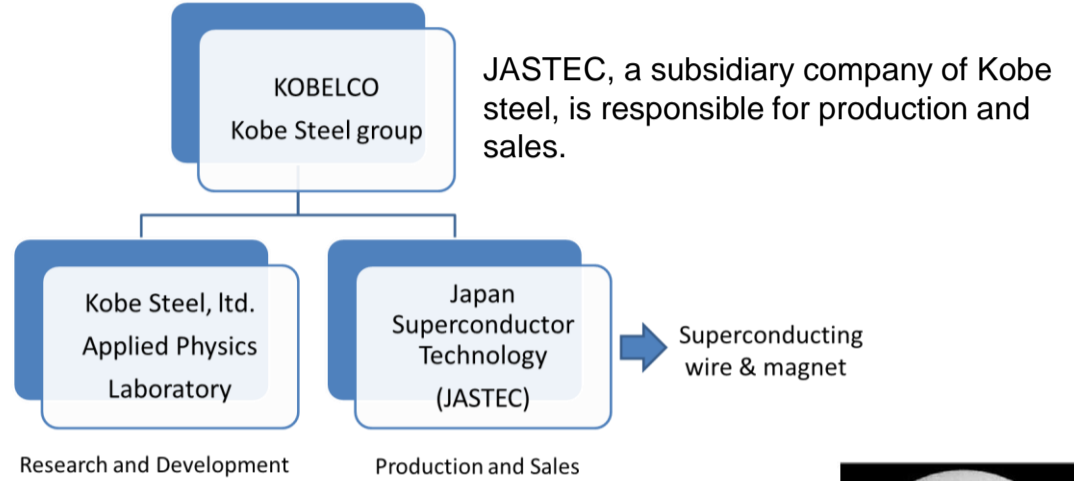


# Development of Distributed Tin processed Nb<sub>3</sub>Sn wire for FCC

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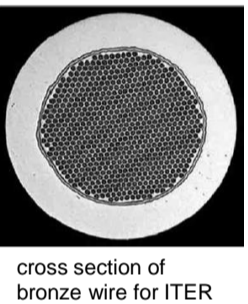
## Introduction

### @ Kobe Steel and JASTEC



### @ Wire products of JASTEC

• Wire type : NbTi, Nb<sub>3</sub>Sn  
 Application : NMR, MRI, Accelerator  
 Topics : ITER Wire

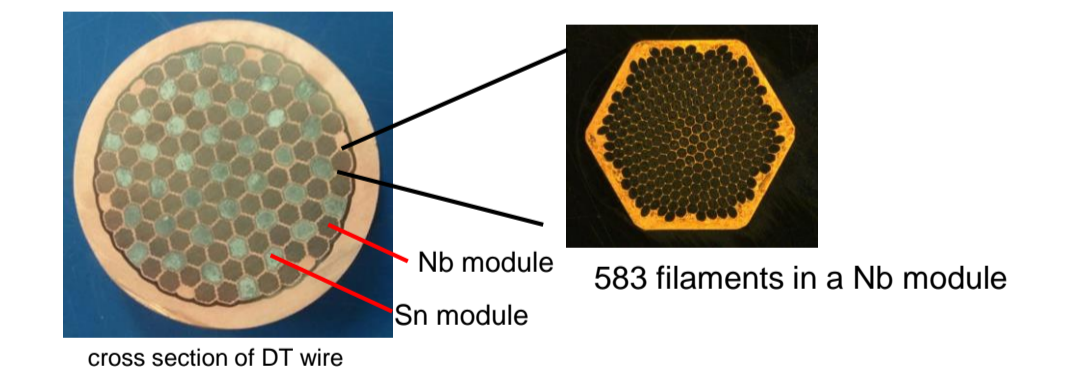


• JASTEC is a world leading supplier of ITER Nb<sub>3</sub>Sn strand!  
 - 40 tons for TF conductor (40% of JAPAN contribution)  
 - 60 tons for CS conductor (43% of total procurement)

## Development for FCC wire in KSL/JASTEC

### @ Distributed Tin (DT) processed Nb<sub>3</sub>Sn wire

We are developing the DT process, with **higher Sn concentration**.  
 ⇒ Bronze process : < 16 wt %Sn, **DT process : 37.3 wt %Sn**



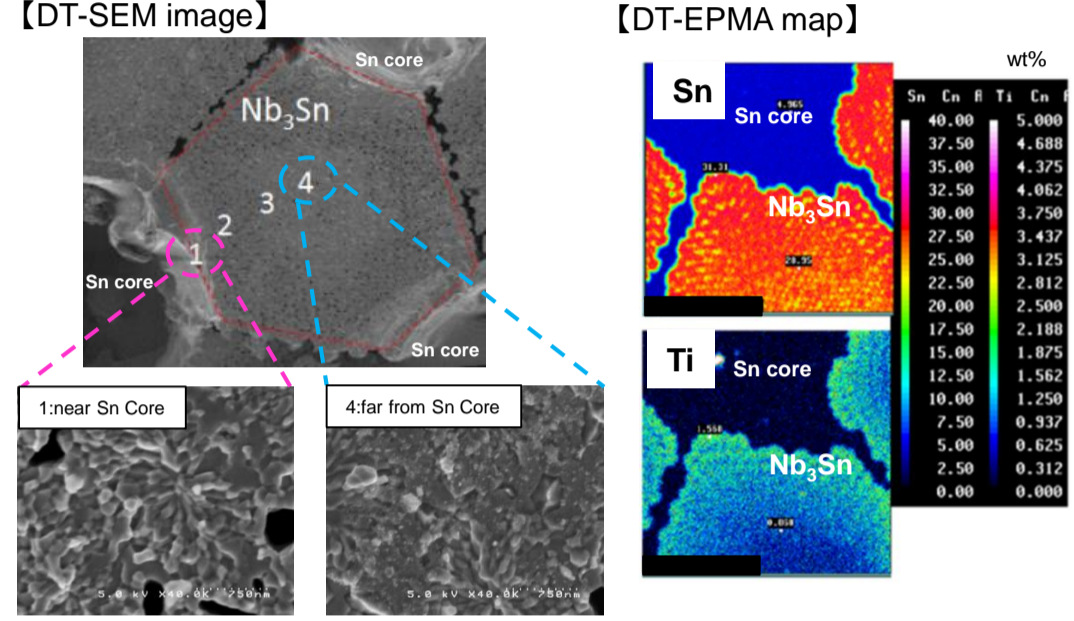
Specification	
wire diameter [mm]	0.8~1.5
Cu ratio	0.34
n value	> 30
RRR	> 100
non Cu Jc [A/mm <sup>2</sup> ]	1900@12T 800@16T
over all Jc [A/mm <sup>2</sup> ]	1400@12T 600@16T

### @ 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

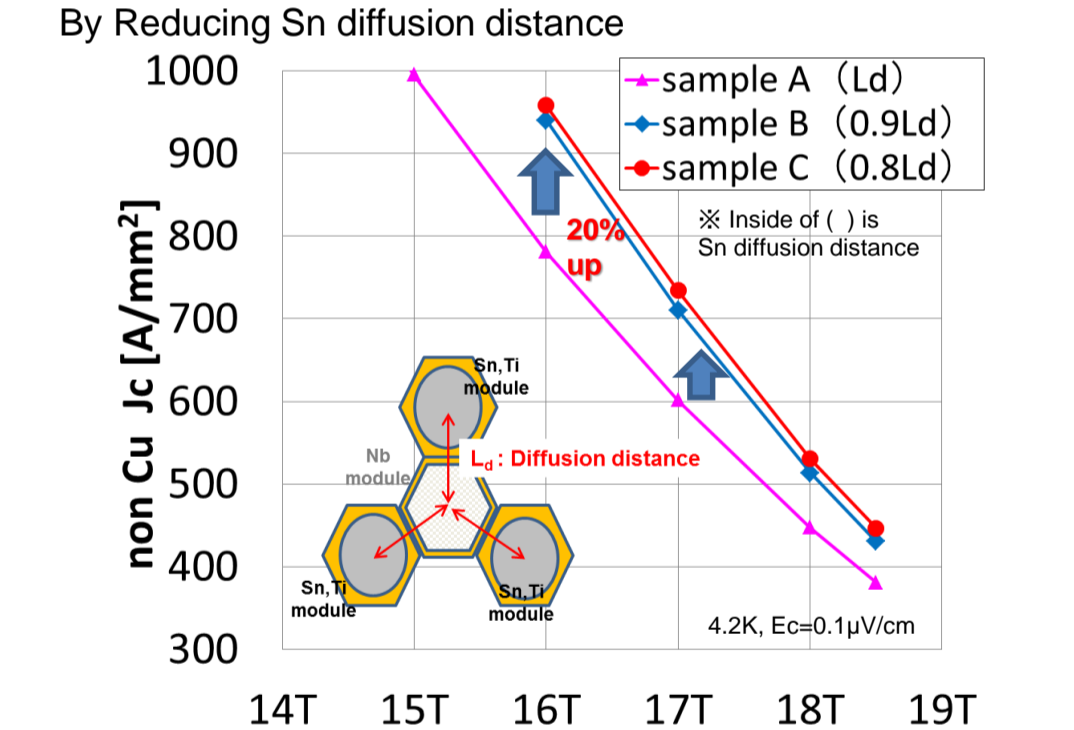
## Test and results

### @ Analysis of present DT wire after Heat Treatment

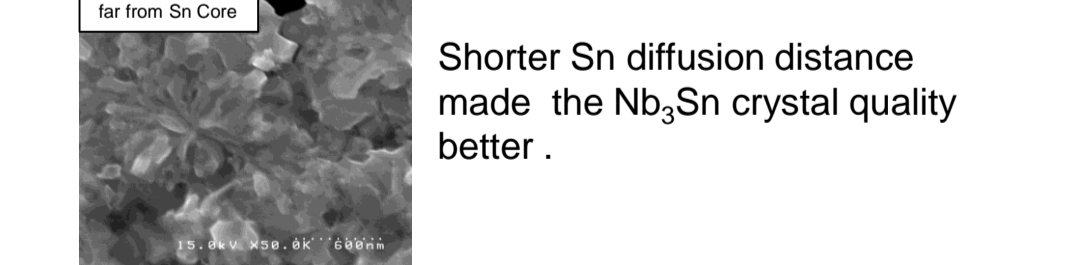


• Near the center of Nb module, the number of fine crystal grains decrease. Also the distribution of Ti and Sn seems poor.

### @ Improvement of Sn diffusion



### 【 DT-SEM image of shorter Sn distance sample】



## Conclusion and Next steps

- <Conclusion>
- DT wire as a high Jc Nb<sub>3</sub>Sn wire for FCC.
  - By improving Sn diffusion, non Cu Jc@16T is almost 1000A/mm<sup>2</sup>.
- <Next steps>
- By increasing Nb volume fraction , **non Cu Jc>1100A/mm<sup>2</sup> @16T was a prospect.**
  - Furthermore, we will perform optimization of ternary additive elements and refinement of Nb<sub>3</sub>Sn grain size etc., Our goal is 1500 A/mm<sup>2</sup> @16T.