Development of Distributed Tin processed Nb\textsubscript{3}Sn wire for FCC

**Introduction**

**JASTEC is a world leading supplier of ITER Nb\textsubscript{3}Sn strand!**
- 40 tons for TF conductor (40% of JAPAN contribution)
- 60 tons for CS conductor (43% of total procurement)

**Wire products of JASTEC**
- Wire type: NbTi, Nb\textsubscript{3}Sn
- Application: NMR, MRI, Accelerator
- Topics: ITER Wire

**Development for FCC wire in KSL/JASTEC**

**Distributed Tin (DT) processed Nb\textsubscript{3}Sn wire**
We are developing the DT process, with higher Sn concentration.

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

**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**

By Reducing Sn diffusion distance

<table>
<thead>
<tr>
<th>sample</th>
<th>non Cu Jc [A/mm\textsuperscript{2}]</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (Ld)</td>
<td>1900@12T 800@16T</td>
</tr>
<tr>
<td>B (0.9Ld)</td>
<td>1400@12T 600@16T</td>
</tr>
<tr>
<td>C (0.8Ld)</td>
<td>800@12T 400@16T</td>
</tr>
</tbody>
</table>

Shorter Sn diffusion distance made the Nb\textsubscript{3}Sn crystal quality better.

**Conclusion and Next steps**

<Conclusion>
- DT wire as a high Jc Nb\textsubscript{3}Sn wire for FCC.
- By improving Sn diffusion, non Cu Jc@16T is almost 1000A/mm\textsuperscript{2}.

<Next steps>
- By increasing Nb volume fraction, non Cu Jc@16T was a prospect.
- Furthermore, we will perform optimization of ternary additive elements and refinement of Nb\textsubscript{3}Sn grain size etc., Our goal is 1500 A/mm\textsuperscript{2}@16T.