1. Introduction

- The strain tolerance of MgB$_2$ wire at room temperature (RT) is important to make MgB$_2$ coils by the React & Wind method.
- MgB$_2$ filaments are assumed to be irreversibly damaged by tensile strain at the intrinsic strain $\varepsilon_{\text{int}}=0$, so the tensile strain tolerance at RT must be improved by increasing pre-compressive strain from sintering temperature to RT.
- On the other hand, the compressive limit of strain should be considered to avoid the $I_c$ degradation due to too much compressive strain.

2. Bending sample wire with Cu plate to apply external compressive strain

2.1. Sample wires

Wire 10-Mo
- Monel
- Cu
- MgB$_2$
- Fe
- O.D. = 1.16 mm (tensile)

Wire 18-Mo&SUS
- Monel
- Cu
- SUS
- MgB$_2$
- Fe
- O.D. = 1.5 mm (tension)
- O.D. = 1.16 mm (bend)

2.2. How to apply external-compressive strain

(1) Heat treatment Sample wire
(2) Cu plate soldering (for wire 10-Mo)
(3) Bending Fixed edge Bend and release
(4) $I_c$ measurement Voltage taps

Sample wires

2.3. Strain change along with wire/coil fabrication

- Intrinsic strain of MgB$_2$
- Must be < 0 (tensile limit)
- Bending $\varepsilon$ at smallest radius
- How much is the compressive limit $\varepsilon_{\text{comp}}$ for wire bending at smallest radius

3. Evaluation of compressive strain limit (Wire 10-Mo) and estimation the ideal pre-compressive strain for the R&W method

3.1. $I_c$ measurement results

4. High strain tolerance and high $I_c$ (Wire 18-Mo&SUS)

4.1. $I_c$ measurement results

5. Conclusion

- The ideal pre-compressive strain to minimize reversible bending radius at RT was obtained as -0.88%.
- The pre-compressive strain of the SUS reinforced wire 18-Mo&SUS was measured as -0.60% and it was a little smaller than the ideal value.
- The compressive limit of intrinsic strain is -1.9%.
- So, the ideal pre-compressive strain to minimize bending radius at RT is estimated from a half of this value as -0.88%.