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Jelly-Roll Processed Nb3Al Super-Fine Monofilament Wires with Cu/non-Cu Ratio of 1.0

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Recently, we have reported successful fabrications of the Jelly-Rolled Nb/Al composite monofilament wires having 50 microns in outer diameter. Those Nb3Al super-fine wires show a ductile mechanical performance and may be promising to apply for the React and Wind high field superconducting magnets. However, those Cu/non-Cu ratio was 0.5. So far in our study, it has not been succeeded to draw down them to 50 microns in diameter, when all of copper stabilizer has been located at the outer-most of the Nb/Al composite monofilament wires. In this paper, we have investigated a cross-sectional design of Nb/Al composite monofilament wires with Cu/non-Cu ratio of 1.0. Especially, the optimal location of copper stabilizers and their drawability were studied. We eventually obtained over 1,000 m in the piece length for Nb/Al composite monofilament wire having 50 microns in diameter and Cu/non-Cu ratio of 1.0. Some of 50 microns wire have been drawn down surprisingly to 17 microns, which is the smallest diameter to break the world record (30 microns) of Nb3Al wires. Those superconducting properties and microstructures will be reported in this paper.

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