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M2Po2C-03 [39]: Trial Manufactures of Jelly-Rolled Nb/Al Single Wire with Very Small Diameter below 50 microns

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In general, practical metallic superconducting wires, such as NbTi, Nb₃Sn and V₃Ga, have a fine multifilamentary configuration. Its predominant reason would be pointed as the reduction of electromagnetic losses, the improvement of intrinsic and thermal stabilities, and the reduction of mechanical strain. In particular on the A15 compounds, the promotion of the chemical reaction through the shortening of the diffusion distance would be added to above reason. According to these understandings, so far we have been developing the Nb₃Al monolith wires having multifilament configuration. However, several R&D issues, such as the wire-breakage of multifilamentary precursors, costly Cu stabilizer fabrication, low mechanical irreversible strain, still remains. On the other hand, we are considering dramatically different approach to fabricate Nb₃Al superconducting wires of which have low electromagnetic losses, enough intrinsic and thermal stabilities, excellent flexibility for the coil winding through the React & Wind method, and low fabrication cost. It is the braided conductor that a multiplicity very fine single strands are braided into a cylindrical pattern. Especially, the flat dimensionally transposed braided conductor was called "*BNL Braid*". In this paper, as a first step of new approach, we tried manufactures of Jelly-Rolled Nb/Al single precursor wires having a diameter of less than 50 microns. The drawing workability, microstructure changes, and then superconducting properties after heat treatment of very fine Nb₃Al single wires were investigated.

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