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M2Po2C-04 [40]: Characterization and Image Analysis to Further the Development of Tube Type Nb₃Sn Conductors

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Tube type Nb₃Sn wires are high performance conductors that typically reach a J_c of 2000-2500 A/mm² at 12 T and 4.2 K (1000-1250 A/mm² at 15 T). The wires have performance similar to that of PIT conductors, but are simpler, cheaper, and can be drawn down to finer filament sizes. The conductor consists of a number of subelements, each consisting of a Cu-clad Sn rod inside a Nb-Ta tube, all arranged in a hexagonal array with a Cu matrix and Cu sheath. Conductors with subelement counts from 217-547 have been manufactured in long lengths and used in small magnets, with high levels of low and moderate field stability. In order to fully optimize the conductor, attention must be paid to filament shape and array regularity, both among filaments and along the length. Analysis of scanning electron microscopy images is used to develop a connection between microstructure, RRR, eddy current testing signatures, and critical current at a standard set of heat treatments.

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