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Analytical Investigation in Bending Characteristic of Twisted Stacked-Tape Cable Conductor

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The second generation High Temperature Superconductor (HTS) REBCO tapes are very attractive to various applications of transmission power cables and high field magnets. Cabling methods for the HTS tapes cabling such as Roebel Assembled Coated Conductor (RACC), Conductor-On-Round Core (CORC), Twisted Stacked-Tape Cable (TSTC) and a few other alternates have been proposed and are being investigated for high current, high field applications. We have been developing TSTC cabling method, which consists of stacking flat tapes and twisting them along the stack axis. This compact cabling technique using REBCO tapes is very useful for both power transmission and high field magnet conductors. TSTC conductors has been fabricated by several methods, including sheathing the tape stack with a copper tube and embedding the stack in single and multiple helical grooves formed in a circular rod. In the latter configuration, an untwisted stacked-tape cable or a twisted stacked-tape cable can be embedded in each groove. In real applications of a REBCO tape cable its bendability is very important to fabricate, transport a long cable and wind a magnet. We have experimentally examined bendability of a TSTC conductor. A TSTC conductor is bendable since it is twisted. In this paper bending characteristics of various TSTC conductors, such as a single stack 40-tape cable, double-channel and three-channel cables in a rod will be investigated by an analytical calculation method. Critical current degradation due to bending will be discussed.

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